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Environmental Impact Statement &
Environmental Impact Report
for the proposed

Mesquite Regional Landfill

Imperial County, California

SCH. No. 92051024
BLM No. CA-060-02-5440-10-B026

Prepared by the
Bureau of Land Management
California Desert District

and the
County of Imperial
Planning & Building Department

Environmental Consultant
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San Diego, California

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TECHNICAL APPENDICES

E-1 CULTURAL RESOURCE INVENTORY FOR THE PROPOSED MESQUITE LANDFILL PROJECT AREA

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G VISUAL RESOURCES

H SOCIOECONOMICS

ENVIRONMENTAL IMPACT STATEMENT
ENVIRONMENTAL IMPACT REPORT

for the proposed

MESQUITE REGIONAL LANDFILL

IMPERIAL COUNTY, CALIFORNIA

SCH. No. 92051024
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prepared for

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MESQUITE REGIONAL LANDFILL EIS/EIR

APPENDIX E-1

CULTURAL RESOURCE INVENTORY FOR THE PROPOSED MESQUITE LANDFILL PROJECT AREA

DECEMBER 1993

RESULTS AND RECOMMENDATIONS OF A CLASS III CULTURAL RESOURCE INVENTORY OF THE PROPOSED MESQUITE REGIONAL LANDFILL PROJECT AREA IMPERIAL COUNTY, CALIFORNIA

VOLUME I
TECHNICAL REPORT

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USGS Quad: East of Acolita and Ninemile Wash 7.5'
Acreage: 4700
Keywords: Imperial County, Archaeological Survey, Lithic Scatter, Rock Rings, Prehistoric Trails, Historic Trail, WWII Camp

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I. MANAGEMENT SUMMARY

A cultural resource inventory was conducted for the proposed approximate 4,274-acre Mesquite Landfill Project and related four-to-five mile long by 500-feet wide rail corridor. This included a cultural resource records search of the entire area and a pedestrian survey of 3,000 acres that had not been previously surveyed or was incompletely surveyed. Several sites were previously treated in 15 reports that have been produced in the last eight years of archaeological investigations. A total of 58 archaeological sites and 14 isolates have been documented in the project area. Thirteen sites were newly recorded during the 1992 survey, and five isolated finds were also discovered during this survey. The total archaeological inventory includes rock rings and rock alignments; chipping stations, lithic scatters, or isolated lithics; prehistoric trail segments with associated pot drops and lithic scatters; segments of a historic wagon road that overlies a prehistoric trail and pot drops; and World War II activity areas. This inventory cumulatively represents up to 12,000 years of human activities in this marginal desert environment.

The significance evaluation of these 58 sites indicates that up to 10 may be eligible for inclusion on the National Register of Historic Places (NRHP). These include segments of a historic wagon road and prehistoric trail (a segment of which has previously been determined NRHP-eligible) and nine additional prehistoric trail segments, some with associated features. All of these sites are recommended as significant for scientific values. None of the rock rings and lithic sites are considered National Register eligible. Nine isolated lithics that were previously given site numbers are de facto ineligible. Newly recorded isolates are also ineligible. Three of the trail markers were determined to be of modern construction. One pottery scatter was destroyed by modern grading activities and six rock rings or chipping stations were previously assessed to be ineligible and no longer exist due to Mesquite Mine operations. Two rock rings, one rock alignment, and three chipping stations or lithic scatters previously underwent data recovery to mitigate impacts from Gold Fields Mine and are recommended to be ineligible for inclusion on the National Register because their research potential had been realized. All other chipping stations (one in the railroad corridor), lithic scatters, and rock rings were considered to be ineligible because they lack temporally diagnostic material, possess low artifact content, or lack artifact variability. The eight World War II training sites are recommended as not National Register eligible because of lack of integrity, historical associations, or scientific values.

Impact projections for the proposed Mesquite Landfill indicate that all cultural resources within the project area are likely to be destroyed from surface disturbances. Recommended impact mitigation alternatives include avoidance through project design, if feasible. In the case that sites cannot be avoided, a program of data recovery is recommended for those sites that are determined eligible for inclusion on the National Register of Historic Places through BLM/SHPO consultation. This would involve preparation and approval of a Cultural Resources Treatment Plan, implementation of the plan through field documentation, data recovery, archival research, Native American participation, artifact analysis, preparation of a final research report, and curation. Also recommended is a program of desert varnish investigations that utilizes newly developed radiocarbon and cation-ratio analytic techniques to provide a temporal scale for the investigation of trails and previously collected lithic assemblages at Gold Fields.

II. BACKGROUND

A. Project Description

The proposed Mesquite Regional landfill is primarily located within the boundaries of the currently operating Mesquite Mine and Ore Processing Facility (Mesquite Mine) in Imperial County, California (Figures 1 and 2). The cities of Brawley and Palo Verde are located approximately thirty-five miles to the west and northeast, respectively. The Glamis Beach Store is three miles to the southeast. A four or five mile rail spur extending from the existing Southern Pacific main line track, near Glamis, to the project site will also be built.

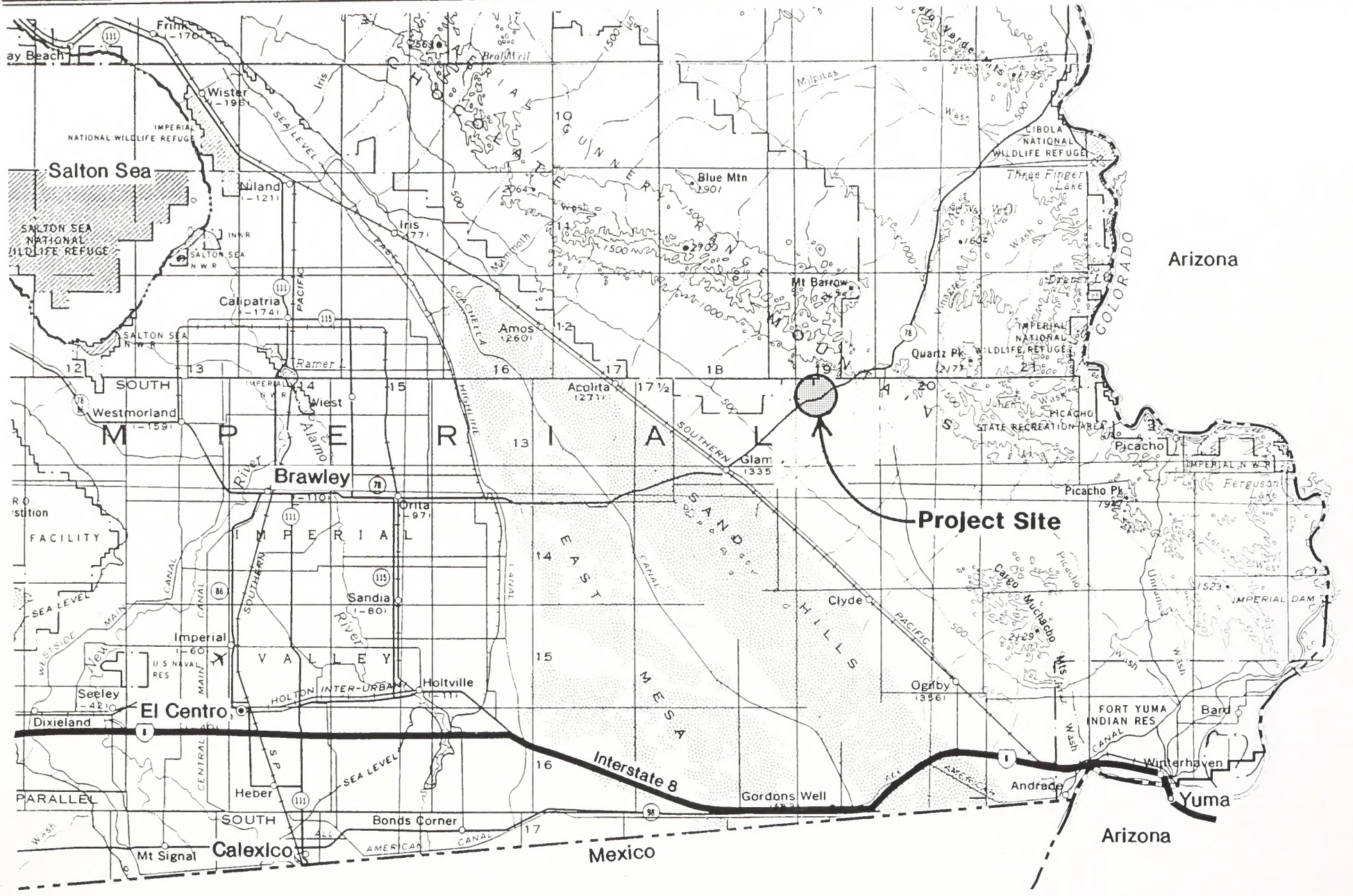
Approximately 600 million tons of Class III municipal solid waste (MSW) would be deposited in the landfill, for a period of 100 years. Excavated materials from the existing Gold Fields Mine would be used to cover the fill. The landfill will be located in adjacent areas to the existing pits which are still in operation.

Of the approximately 4,274 acres in the project area, some 2,580 acres are located on lands currently owned by Gold Fields, while remainder are public lands managed by the U.S. Bureau of Land Management (BLM). The project area includes portions of Sections 7, 8, 16, 17, 18, 19 and 20, Tract 38, and additional unsectioned areas of Township 13 South, Range 19 East as shown on USGS maps East of Acolita and Ninemile Wash 7.5 minute series (Figure 2).

B. Physical Environment

The environmental variables that most directly affected prehistoric lifeways are described below. Ecological relationships between natural environment and cultural systems appear to be most direct among hunter-gatherers. Compared to farmers and herders, hunter-gatherers cause the least change on their environment and rely on the least complex technology (Bettinger 1980). It is therefore essential to understand the environmental constraints and opportunities that shaped hunter-gatherer adaptations in the Colorado Desert as reflected by the archaeological record. Within a hunter-gatherer ecosystem, environmental change will be expected to have the greatest effect on human behavior. Evidence will be reviewed for changes in climate, hydrology, and vegetation within the Colorado Desert and the extent to which present environmental conditions can be projected into the past. Relevant environmental overviews have also been prepared by D. Weide (1976), McCarty (1981), and McGuire (1982).

The Mesquite Project study area is on the far eastern edge of the Salton Trough geographical province within the Colorado Desert of the Lower Sonoran life zone (Sharp 1972:34-41). Few areas of North America are hotter or dryer than this. The only permanent water source is the Colorado River, twenty-one kilometers to the east, and as a result, vegetation is sparse and widely distributed. Today, as in the past, the area remains marginal for any human occupation because of environmental conditions.

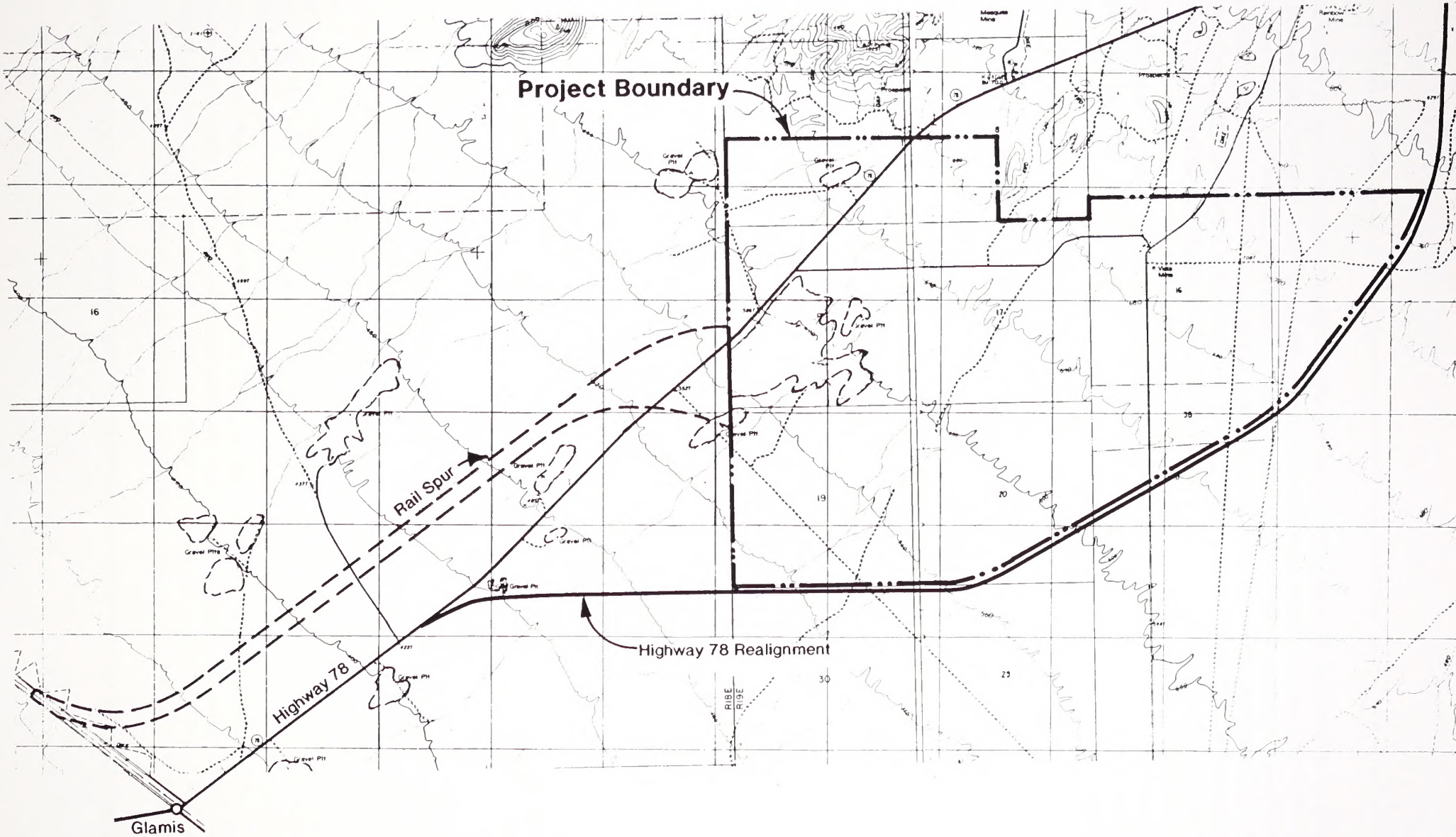


Regional Location Map

Figure 1

Brian F. Mooney Associates

SOURCE: U.S.G.S. 1:500,000 Quad



Project Area Map

Brian F. Mooney Associates

N

0 2000' 4000'

Figure 2

SOURCE: U.S.G.S. 7.5' Quads (East of Acolita and Ninemile Wash)

The cultural resources lie on alluvial terraces of Pilot Knob Mesa, bordering the western side of the Chocolate Mountains (see Figures 1 and 2). These low, heavily eroded mountains form part of a broken chain extending northwest into the Little San Bernardino Mountains. They remain geographically transitional between the Transverse Range of California and the Basin-Range province of the Great Basin (Sharp 1972:33). The Chocolate Mountains form a barrier separating the lush Colorado River floodplain to the east from the barren alluvial terraces and the Imperial Sand Dunes to the west. A break in the mountains, through which State Highway 78 now passes, would also have provided a natural pass for prehistoric populations travelling from the Colorado River to resource collecting areas on Pilot Knob Mesa or further west when ancient Lake Cahuilla provided additional lacustrine resources. Elevations range between about 500 and 800 feet above mean sea level (AMSL). The project area is located on the east side of Pilot Knob Mesa which slopes down from 900 feet AMSL at the base of the Chocolate Mountains on the east to only 350 feet AMSL at the sand dunes to the west. The Chocolate Mountains immediately to the north and east only reach a height of 2,800 feet AMSL.

The surface geology of the Mesquite Project area is characterized by late Pleistocene and Holocene alluvial terraces of the Chemehuevis Formations fanning down from the Chocolate Mountains. They are composed of largely unconsolidated, poorly sorted silts and interbedded gravels. The terraces are dissected by shallow sandy washes of late Holocene to recent date (Jenkins 1962; Morton 1977; Waters 1984). The terraces are covered by a distinctive desert pavement composed of well-rounded pebbles and cobbles. Wind and water have eroded away the fine silts and sands that originally formed the suspending matrix of these pebbles, leaving a compact mosaic of stones on the surface, called a desert pavement. It is estimated that up to 46 centimeters of sediment may be deflated before a desert pavement is completely formed (Hayden 1976:275-279; Rogers 1966:43). Once formed, the pavement reaches an equilibrium precluding further erosion unless the surface is broken (Wilshire and Nakata 1976).

The desert pavements provided the native populations with a variety of raw materials for fashioning stone tools. The finest materials were small jasper and chalcedony noddes originating from the Mesozoic Era quartz monozonite granitic and quartz diorite formations in the Chocolate Mountains. Of poorer quality but occurring in larger pieces are the extruded Cenozoic Period volcanics from the Chocolate Mountains. These rocks include light greenish-grey andesite and rhyolite. Further south along the Chocolate Mountains are greater quantities of vesicular basalt and pyroclastics (Jenkins 1962; Morton 1977).

The individual stones making up the desert pavements, and many of the stone artifacts found in association, are often coated by desert varnish. It has been long known that this varnish is made up of clay minerals, iron oxides, and manganese oxides originating from airborne desert dust (Engle and Sharp 1958; Potter and Rossman 1977; Pe'we' 1978). The underside of a pavement stone will be reddish-orange in color while the upper exposed surface is dark brown or black. Even though the process of desert varnish formation has been much disputed, archaeologists have used observations of "thickness" and color to estimate the relative age of artifacts (Hester and Heizer 1973:39-40; McGuire and Schiffer 1982:15; Rogers 1966:35). Most archaeologists realize, however, that the technique is far from reliable, but it may be all they have to use for any age determinations, given the surfacial nature and lack of diagnostics on desert pavement archaeological sites. Recent studies by Dorn and Oberlander (1981) strongly indicate that varnishes are laid down by microbial organisms

and that the rate of incipient varnish formation may be very short. Previous studies by Elvidge (1979) suggest inorganic origins and lapses of over 3,000 years for the development of incipient varnishes with over 10,000 years needed to form a heavy deposit (McGuire and Schiffer 1982). The varnish rate actually appears to be quite variable as observed by Waters (1984:4). To further fuel the controversy, Pendleton (1984:180) recovered two bifaces from the Picacho Basin that were very heavily varnished but would have to be classified as "late" based on morphology.

Efforts are currently being made to use varnish for absolute dating (Dorn 1982). A cation-ratio dating technique is being investigated by measuring the replacement rate of potassium and sodium by metallic ions such as titanium. What are needed, however, are diagnostic tools or artifacts with other clear-cut associations that establish their date independently from the varnish, thereby allowing for the calibration of the catio-ratio dating (Dorn and Bamforth 1988; Dorn et al. 1986; Dorn and Oberlander 1981; Dort et al. 1987; Dorn and Whitley 1983, 1984).

Current climatic conditions provide for dry, mild winters and dry, hot summers. Yuma weather records indicate a mean winter low of 44°F (6.7C) and a mean summer high of 104°F (40.0C), with record highs of 120°F (48.9C). Precipitation in the region is insignificant. There are an average of seven thunderstorms in the summer resulting from the desert southwest monsoon pattern, but they only produce an average of 0.83 inches (2.1 cm) of rainfall. The winter mean is only 1.30 inches (3.3 cm). When rain does fall, it often occurs as violent localized storms that produce extensive runoff but little useful water.

The limited precipitation has produced a sparse creosote-bursage scrub vegetation community (Collins 1976; Jaeger and Smith 1966; McCarty 1981). The desert pavement covered terraces have sparse vegetation, while the sandy washes retain enough water to sustain more plants. The most commonly occurring species include *Larrea tridentata* (creosote), *Ambrosia dumosa* (bursage or burrow bush), *Fouquieria splendens* (ocotillo), *Encelia farinosa* (brittle bush), and *Opuntia basilaris* (beavertail cactus). Larger washes also contain some additional species representing the woodland-wash vegetative community. Woodland associations include *Olneya tesota* (ironwood), *Cercidium floridum* (palo verde), *Parosila spinosa* (smoketree), *Acacia greggii* (catclaw), and rarely *Prosopis glandulosa* (honeybean mesquite) (von Werlhof 1984). Seasonal grasses and various *Atriplex* (saltbush) species may also be found in the project area.

The February-March 1992 field season was an unusually rainy period that produced exceptional growth of ephemeral plants and associated wildlife. Observed reptile species included desert tortoise and sidewinder rattlesnake.

While several of the plant species listed above have known aboriginal uses (Bean and Saubel 1972; Forde 1931; Castetter and Bell 1951; Pendleton 1984:65-76), none occur in sufficient variety or density to make the area an attractive food collecting zone. Only the beans of the mesquite were a preferred wild food source, while the beans of ironwood, screwbean, and other related species were considered quite inferior "famine foods." The oasis-like conditions of the Colorado River floodplain certainly provided wild plant resources in greater abundance and with greater reliability than the desert areas. The larger washes to the south and east also provided more useful woodland-wash habitats for either bean exploitation or collection of hard woods.

Evidence of earlier environmental conditions are very limited. Pollen bearing stratified deposits from caves or lake beds are not as common in the Colorado Desert as they are in the Great Basin where most of the climatic reconstructions are based. Very recent data, however, indicates that the area was already approaching modern desertic conditions by the beginning of the Holocene Period and the advent of the earliest well-documented cultural remains (Thompson 1984).

Ernest Antevs first developed a tripartite model of environmental change in western North America (1948, 1952). This model was widely accepted by archaeologists, although there were a few objections (Jennings 1957). The past two decades of research in palynology and sedimentology, with chronological control provided by radiocarbon dating, have substantially modified Antevs' original formulation. Time depth has been expanded and Antevs' middle Holocene climatic period, the Altithermal, has been reevaluated. This very dry/hot interval between 7,000 and 4,000 years before present (B.P.), may only be applicable to the Northern Mojave and Great Basin, and not to the southwest deserts where the summer monsoon patterns produced a less severe climatic regime (Aikens 1979; Mehringer 1977; Van Devender and Spaulding 1979). There is also greater awareness that minor fluctuations may have effected prehistoric populations, although these short-term shifts are difficult to document.

Based on current information, the climatic history of the area may be summarized as follows (Van Devender and Spaulding 1979):

> **Late Pleistocene (22,000 to 11,000 B.P.).** Cooler and wetter conditions supporting Pinyon-Juniper Woodlands, expansive deep lakes, and savannah grasslands at low elevations.
>
> **Early Holocene (10,000 to 8,000 B.P.).** Gradual warming and drying conditions resulting in the shrinking of lakes and replacement of woodlands by creosote-bursage scrub communities at lower elevations.
>
> **Middle to Late Holocene (8,000 B.P. to present).** Warm and dry conditions continue, dominated by summer monsoons in the desert southwest and winter storms along the Pacific Coast. Lakes in low-lying basins completely dry up or become only short term shallow bodies. Locally specific fluctuations in temperature and aridity produced ecological variation of no greater magnitude than known from historic records.

The most recent pollen and macrofloral studies near the project area strengthen this model of climatic change, although they indicate that arid climatic conditions and Lower Sonoran vegetation had already been established by the very beginning of the Holocene. Packrat (*Neotoma* spp.) middens from Picacho Peak in the southern Chocolate Mountains (Thompson 1984) and from low elevation sites in the Wellton Hills area near Yuma (Van Devender 1973) have been radiocarbon dated between 10,500 and 8,000 B.P. They have been found to contain the full compliment of creosote-bursage scrub species. The Picacho Peak middens also produced desert mouse bones (*Perognathus baileyi*) which also indicates warm/dry conditions in the early Holocene. These data are additionally supported by a recent examination of quaternary geomorphic surface in the Picacho Basin, California, just south of the project area (Waters 1984). Changing vegetation patterns due to climatic shifts can be indirectly traced by observing changes in the mode of sedimentation and stream channel action. These erosional processes are indicated by soil characteristics, surface morphology, and particle size.

From such observations, Waters reconstructed a semi-arid climatic and vegetative pattern in the Late Pleistocene and earliest Holocene, followed by arid conditions throughout the Holocene.

Pollen records from upland areas of Arizona do indicate climatic shifts at 11,000 B.P. and 8,000 B.P. resulting in the ascension of pinyon-juniper and oak woodlands to higher elevations. Desert vegetative communities had already established themselves in the lowlands, however, and these changes had little effect on local human adaptations in the Colorado Desert (Thompson 1984). Even in the late Pleistocene, there is evidence to suggest that a refugium of desert species survived in the southern Sonoran Desert, including the Lower Colorado River Valley (Wells and Hunzinger 1976).

Pollen studies from the middle and late Holocene period are few, but several dispute Antevs' model of a warm/dry Altithermal, at least for the Sonoran Desert (Thompson 1984). In any case, it is clear that the prehistoric occupants of the Colorado Desert were confronted with very similar climatic and vegetative conditions as are presently found. What cannot as yet be determined is micro-environmental variability in the prehistoric period. White (1974), however, has assembled documentation of periodic droughts along the Colorado River in ethnohistoric times and its effect on tribal warfare and territoriality.

The most important environmental change in the Late Holocene period of the Colorado Desert was the formation of ancient Lake Cahuilla. Approximately 950 years ago the Colorado River, in flood, broke through its natural deltaic cone of the Gulf of California and turned north into the Salton Trough. For the next 450 years, the river poured into what is now Imperial and Coachella Valleys to produce a 96 meter (315-foot) deep lake. An oasis-like lacustrine environment then developed around the shoreline, at about 12 meters (40 feet) AMSL. A string of shorelines, marshes, and embayments ringed the lake, supporting habitats for shellfish, fish, waterfowl, cattail reeds, and other economically important resources for the local inhabitants (Wilke 1976, 1978). The lake shore attracted people from the Colorado River, the Mojave Desert, and the Peninsular Range; and they all left their remains on the now relic shoreline. There is also some evidence for periodic fluctuations in the depth of Lake Cahuilla during the late prehistoric period that effected settlement patterns. Much deeper earlier lakes are also documented for the Late Pleistocene period but none of those shorelines are directly associated with any cultural remains (Waters 1980). In any case, the Colorado River finally returned to its original course after a drought reduced the velocity of flow about 350 years ago (A.D. 1600). Evaporation caused the lake to gradually recede, drying up the littoral marshes and embayments. Eventually the water became too saline to support much wildlife, and most of the native population ceased to inhabit the area, returning to their home territories in the Peninsular Range and along the Colorado River.

C. Cultural History

A generally accepted outline of Colorado Desert culture history has been recognized by the archaeological community, but not without the realization that it is at best a superficial construct whose details are not well understood. This culture history is based on the pioneering work of Malcolm Rogers in the Picacho Basin and many parts of the Colorado and Sonoran Deserts (Rogers 1939, 1945, 1966). Since then, several overviews and re-syntheses have been prepared with each succeeding effort drawing on the previous studies and adding new data and interpretations (M. Weide 1976; Crabtree 1981; Schaefer 1984c). Most culture history reconstructions derive from survey data

and surface-collected artifacts with extremely uncertain chronological controls. The only major data recovery project on desert pavements, the Picacho Basin Project (Pendleton 1984), as well as smaller testing and excavation projects (e.g., Carrico and Gallegos 1980), confirm doubts that many of the cultural developments or establishment of cultural affiliation of contemporary sites will probably remain an impossible task. Only at Late Prehistoric ceramic bearing sites will more precise cultural reconstructions be possible (e.g., Wilke 1976).

Six successive cultural patterns may be defined for the Colorado Desert, extending back in time over a period of at least 12,000 years. They are: 1) Malpais (Early Man), 2) San Dieguito, 3) Pinto and Amargosa, 4) Patayan (Prehistoric Yuman), 5) Historic Yuman, and 6) Historic Euro-American. Four of these are represented by the cultural resources under consideration in the Mesquite project area. These are the San Dieguito, Patayan, possibly the Historic Yuman patterns and the Historic Euro-American. These patterns will therefore be discussed in greater detail, with reference to the development of relevant research questions and assigning cultural identifications to specific sites.

1. Malpais (Early Man) Pattern

The Malpais Pattern is represented by a complex of archaeological material hypothesized to date from 12,000 to 50,000 years B.P. (Begole 1973, 1976; Davis, Brown and Nichols 1980; Hayden 1976; von Werlhof et al. 1977). The term Malpais was originally used by Malcolm Rogers (1939, 1966) for ancient-looking cleared circles, tools, and rock alignments that he later classified as San Dieguito I. The term continued to be applied to heavily varnished choppers and scrapers found on desert pavements of the Colorado, Mojave, or Sonoran deserts that were thought to predate the San Dieguito Culture and Paleo-Indian tradition of projectile point makers. Although few would refute that most of the artifacts are culturally derived, dating methods remain extremely subjective and have been assailed on numerous grounds (Taylor and Payen 1979; McGuire 1982:160-164). Arguments for Early Man in the Colorado Desert are further eroded by the redating of the "Yuha Man". Originally dated to over 20,000 years B.P. based on radiocarbon analysis of caliche deposits, more reliable dates using the accelerator (ASM) method on actual bone fragments now place the burial at about 5,000 years B.P. (Taylor et al. 1985).

2. San Dieguito Pattern

Most of the ceramic lithic assemblages, rock features, and cleared circles in the Mesquite project area have been assigned to the San Dieguito Complex, Phase III (von Werlhof 1984). Indeed, most of the sites in the entire Colorado Desert are assumed to be San Dieguito, dating between 7,000 and 12,000 years B.P. Malcolm Rogers first defined the San Dieguito complex based on surface surveys in the Colorado and Sonoran Deserts, but later refined his constructs with excavated material from the C.W. Harris site, located along the San Dieguito River a few kilometers east of the Pacific coast (Rogers 1929, 1938, 1939, 1966). Rogers saw three phases of the San Dieguito Complex in the Central Area, that is the area of the Colorado and Mojave Deserts, and the western Great Basin. Each phase is characterized by the accretion of new, more sophisticated tool types on the already existing tool kit.

San Dieguito Complex lithic technology is based on primary and secondary percussion flaking of cores and flakes. San Dieguito I and II phase tools include bifacial and unifacially reduced choppers

and chopping tools, concave-edged scrapers (spokeshaves), bilateral-notched pebbles, and scraper planes. Appearing in the San Dieguito II phase are finely-made blades, smaller bifacial points, and a larger variety of scraper and chopper types. The San Dieguito III phase tool kit is appreciably more diverse with the introduction of fine pressure flaking. Tools include pressure-flaked blades, leaf-shaped projectile points, scraper planes, plano-convex scrapers, crescentics (amulets) and elongated bifacial knives (Rogers 1939, 1958, 1966; Warren and True 1961; Warren 1967). Various attempts have also been made to serrate cleared circles into phases, but no convincing chronological scheme has yet to emerge.

Because of the surfacial nature of desert sites and the lack of chronological indicators, no one has substantiated the validity of Rogers' phase designations as chronologically successive changes in the tool kit of a long-lived culture. Subsequent excavations at Rogers' C.W. Harris site also failed to confirm his original observation of a stratigraphic separation of Phase II and Phase III assemblages (Warren 1967:171-172). Indeed, phase distinction may as likely be due to economic specialization at specific site loci or even to sampling error whereby later phase diagnostic artifact types are not represented in a specific archaeological collection. Rogers (1966:39) also identified different settlement patterns for each phase but as Vaughan (1982:6-11) has argued, these distinctions are poorly defined and inconsistently applied.

No phase distinctions will be made for the San Dieguito in future discussions. It will be considered, rather, as a single archaeological and cultural entity with considerable time depth. A consideration of inter-assemblage variability will be the subject of empirical study, but no de-facto assumptions of temporal phases will, or should be, made here.

The San Dieguito Culture, as designed by the known complex and site associations, is a hunter-gatherer adaption based on small mobile bands exploiting small and large game and collecting seasonally available wild plants. The absence of ground stone from any complex has been seen as reflecting a lack of hard nuts and seeds in the diet, and as a cultural marker separating the San Dieguito Culture from the later Desert Culture (Rogers 1966; Moratto 1984; Warren 1967). Portable manos and metates are now being increasingly recognized at coastal sites with radiocarbon dates in excess of 8,000 B.P., and in association with late San Dieguito (III) adaptation. Arguments are also being made for the presence of a developed grinding tool assemblage in earlier periods, based on finds from the Trans-Pecos area of Texas (Ezell 1984). In regards to the Colorado Desert, Pendleton (1984:68-74) also remarks that most ethnographically documented pounding equipment for processing hard seeds, mesquite, and screw beans were made out of wood and do not preserve in the archaeological record.

Settlement patterns also indicate some basic elements of the San Dieguito Culture. Sites are characteristically located on any flat area, but the largest aggregations occur on mesas and terraces overlooking the larger washes. Where lakes were present, sites are located around the edges. These are areas where a variety of plant and animal resources could be located and where water would at least be seasonally available. It may be assumed that at the beginning of the Holocene period, these areas were somewhat more suitable for habitation, although the climatic evidence reviewed above suggest that the early San Dieguito inhabitants already had to adapt to arid conditions.

Pendleton (1984) has made a strong case, based on ethnographic analogy from Colorado River based tribes, that the San Dieguito occupation in the eastern Colorado Desert was focused on the river floodplain. Surrounding desert areas were used only to a limited degree for special resource utilization within a foraging radius of logistically organized collecting groups. She tested her model with the large array of sites and data sets in the Picacho Basin, thirty-five kilometers to the southeast of the Mesquite District.

3. Pinto and Amargosa Patterns

The Pinto Complex, dating between 7,000 and 4,000 B.P., and the Amargosa Complex, dating between 4,000 and 1,000 B.P., were regional manifestations of the Desert Culture that enveloped the Great Basin and California Deserts. They represent regional specializations of a diversified hunting and gathering tradition. Most of the tool types are similar to the San Dieguito, but there are the added notched and large-stemmed projectile points and more frequently occurring manos and metates that identify these later sites. These complexes are not well represented in the Colorado Desert. There may just be too few diagnostics with which to distinguish these sites from earlier and later patterns, or as suggested, periodic droughts interspersed by brief flooding of the Salton Trough may have discouraged any long-term use of the area (Crabtree 1981:40-41; Weide 1976:85-87). In any case, it appears that the Desert Culture provided the technological basis and subsistence practices that later developed into the Patayan Pattern.

4. Patayan Pattern

The Patayan Pattern is typified by small mobile groups living in dispersed seasonal settlements along the Colorado River floodplain. They erected rock outlined jacale structures, semi-subterranean earth houses, simple ramadas, or brush huts, depending on the season and function of the settlement. Long-range travel to special resource collecting zones, trading expeditions, and possibly some warfare are reflected by the numerous trail systems throughout the Colorado Desert. These trails are often found associated with "potdrops", trail-side shrines, and other evidence of transitory activities. Many of the pictographs, petroglyphs and bedrock grinding surfaces in the Colorado Desert have also been associated with the Patayan Pattern, although direct dating and cultural affiliation of such features is difficult to determine.

5. Ethnohistoric Yuman Pattern

The first historic accounts of the traditional inhabitants of the lower Colorado River were made by Spanish, and later, American explorers. The first professional anthropological account of the lower Colorado Yuman groups was prepared by Kroeber (1920). The closest current group to the Gold Fields project area, the Quechan (pronounced Kwutsan), were documented by Forde (1931) in what remains the standard work. Ethnographies have also been prepared for many of the neighboring groups and a synthesis of these has been made by Pendleton (1984:38-54), focusing on the Mojave, Quechan, and Cocopah.

The Quechan are a Yuman-speaking group of the Hokan linguistic super-family. They are culturally and linguistically related to the Cochimi, Cocopa, Halyikwamai, Kohuana, Kamia, Diegueño

(Kumeyaay), Kiliwa, Walapai, Havasupai, Yavapai, Halchidoma, Maricopa, and Mojave. They also shared many cultural and technological aspects with the Shoshonean-speaking Cahuilla and Chemehuevi to the north and west (Forde 1931:104-106).

As with the prehistoric Patayan, the possibility exists that some of the cultural resources in the Gold Fields project area were produced by ethnohistoric Yumans. Their use of the area, however, would be expectantly low and the absence of datable remains will make it difficult or impossible to assign any dates to this cultural pattern. The rock art site, pot drops, and some of the unpatinated lithic scatters are the most probable Patayan-Ethnohistoric finds.

6. Historic Euro-American Pattern

The project area remained peripheral to human activities after the first Spanish contact in AD 1540. Yuma was the center of most events during the three historic phases of Euro-American development: Spanish imperialism and missionization (1540-1821), Mexican and American frontier development (1821-1881), and post railroad modernization (1880-present). Only mining and some military maneuvers left a mark on the cultural landscape of the project area (von Werlhof 1984:15-17).

From the mid-1880s to 1916, present-day southeastern Imperial County was the scene of a significant though relatively unknown mining boom. The area was worked on a small scale by Spanish and Mexican miners before Americans entered the district in the late 19th century (Henshaw 1942:52). Completion of the Southern Pacific Railroad line from Yuma to Los Angeles in 1877 brought increased mining activity. In 1883-84 the Gold Rock mines were discovered in the Cargo Mucho Mountains approximately fifteen miles southeast of the Mesquite Gold Fields area. The find launched a general rush into the area. By 1900 Gold Rock had developed into a mining camp of about 400 inhabitants, known as Hedges. Other mines in the area included the Pasadena, American Girl, Valencia, Padre-Madre, Cargo Muchacho, and the Paymaster in the Chocolate Mountains. Small scale placer mining was most likely going on in the Mesquite area by the turn of the century (Shackley and Van Wormer 1989:80). Numerous individual placer miners worked small claims in the eastern Imperial Valley at the turn of the century; most had permanent residences in Hedges. Mining activity continued in the region until 1916 when most of the mines closed down. A small temporary mining camp dating from 1910-1917 was excavated by Shackley and Van Wormer (1989) in the Mesquite Project Area.

From 1916 to 1930, hardrock mining continued in areas first worked in the 1890s. In 1937, the earliest recorded mine claim for the Mesquite district was made by the Desert Gold & Aluminum Company. Water for gravity separation of materials was provided by a well, drilled to a depth of 700 feet and lined with a twelve-inch casing.

The southern California and western Arizona desert regions were the location of extensive training centers and exercises during World War II. The Desert Training Center (DTC) was opened on April 30, 1942, remained active for thirteen months, and then closed as the war activity declined. The first commanding officer was Major General George S. Patton who initiated an intense program of conditioning soldiers to desert conditions. Over one million men passed through this training. Though the Mesquite Project Area was not the site of any of the larger, more permanent division camps such as Iron Mountain or Camp Cady, the area was used for training purposes as evidenced

by the numerous tank tracks and occasional bivouac areas. One such small company camp site was recorded and tested by Elling and Schaefer (1988).

Mining activities were halted by the second War Powers Act of 1942 when the Mesquite District became part of the WWII training ground. After the war, mining and prospecting activities resumed but interest soon waned in the face of low gold prices.

In the 1970s, mining interest was reawakened by rising gold prices and the introduction of heap-leaching technology. In 1980, Gold Fields Mining Corporation became interested in the Mesquite District and began a program of land acquisition and mining. Today the Gold Fields Mine is the second largest in the state. It has produced over one million ounces of gold.

III. METHODS

A. Previous Research

1. History of Research in the Gold Fields/Mesquite Area

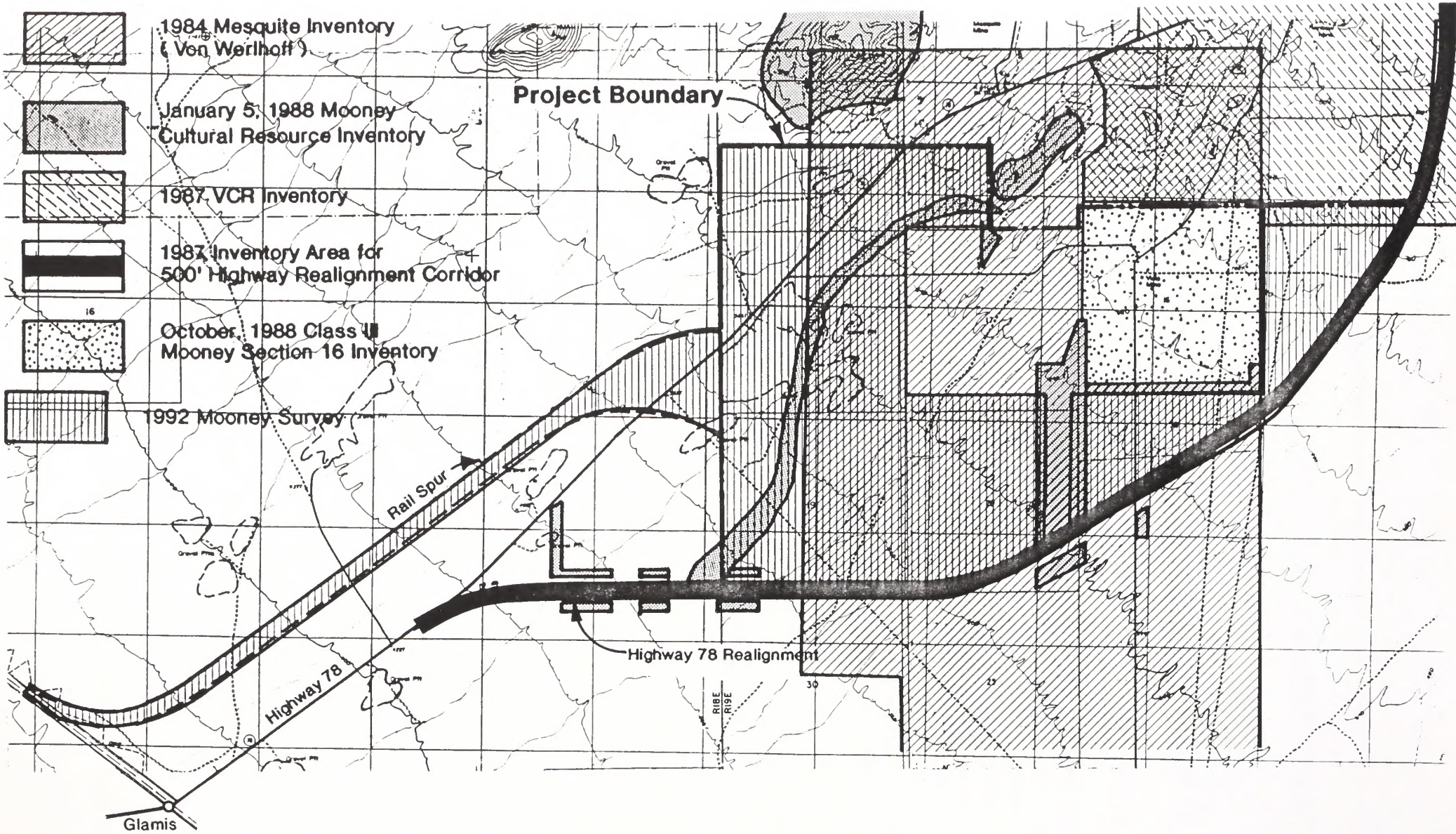
The first systematic survey in the Chocolate Mountains was conducted by the Imperial Valley College Museum (von Werlhof and von Werlhof 1977). They employed a combined random and purposive sample strategy in eight areas of the Naval Weapons Center, Chocolate Mountains Aerial Gunnery Range, directly north of the Mesquite Mine and including the Salvation Pass and Surveyors Pass areas. Their findings confirm or support those of the Mesquite Project; that the Chocolate Mountains settlement system is dominated by dispersed hunter-gatherer camps of seasonal or short duration and tool making loci at sources of usable lithic material. Most of the ceramic sites, cleared circles, and rock rings are attributed to the San Dieguito period, while ceramic scatters, often associated with trails, are interpreted to represent Late Prehistoric transience between the Colorado River and Lake Cahuilla.

Although new paleoenvironmental data that has been published since the IVCM survey alter some of the explanations of San Dieguito subsistence change; the survey results and botanical studies confirm that the Chocolate Mountains were a marginal area for hunters and gatherers.

The archaeology of the Mesquite Area first came to light in 1982 when Gold Fields Operating Company contracted with Imperial Valley College Museum (IVCM) to survey 11.7 square mile (7,500 acres) for a proposed open pit gold mine and leaching operation (Figure 3). Under the direction of Jay von Werlhof (1984a) IVCM recorded seventy-seven sites, including numerous trails, chipping stations, lithic scatters, rock rings, cairns, cleared circles, geoglyphs, sherd scatters, historic sites, and one petroglyph complex. Subsequent inventories were to show that IVCM consistently missed a substantial number of sites.

Field work by IVCM included intensive systematic surveys of Sections 5, 8, 9, 17, 20, 21, 28, 29 and 33 in Township 13 South, Range 19 East, as well as the east half of Sections 7, 18, 19 and 32, the south half of Section 5, and the northeast quarter of Section 30. In addition to these surveys, numerous access roads and drill hole sites were also surveyed so that cultural resources could be avoided during the preliminary core drilling phases of the Mesquite Mine project.

An evaluation of National Register eligibility by BLM indicated that fourteen sites were eligible, twenty-three were ineligible, and six were indeterminate. Most of the sites, no matter which category, were avoided through project design or fencing programs (Schaefer 1985c). Thirteen sites remained that required testing or data recovery in support of a "Determination of No Adverse Effect" concurrence from the Advisory Council on Historic Preservation.



Previous Mesquite Mine Surveys
Current 1992 Mooney Survey

Brian F. Mooney Associates

N

0 2000' 4000'

Figure 3

SOURCE: U.S.G.S. 7.5' Quads (East of Acolita and Ninemile Wash)

A partial survey was later undertaken of the south half of Section 8 and the north half of Section 7 in which twelve sites were recorded (von Werlhof 1984b). In August 1984, Mooney-LeVine was contracted to prepare a Cultural Resources Management Plan (CRMP) for the testing and data recovery of National Register eligible and indeterminate sites within direct impact zones of the project (Schaefer 1984a). This document constituted the research design that was implemented to produce a data recovery report (Schaefer 1986). Mooney-LeVine also developed policies for the protection of a historic wagon road and a prehistoric petroglyph complex that adjoin the mine area. This fencing program is described in more detail in Schaefer (1985c) and was successfully implemented under the supervision of Pat Welch, BLM, El Centro Resource Area Archaeologist.

Following the preparation and acceptance of the CRMP, additional surveys were undertaken to re-evaluate the definition and significance assessments of sites in Sections 4 and 6 and to intensively survey a 113-acre project addition in the southwest corner of Section 4 (Schaefer 1984b). The fifteen sites originally defined by von Werlhof (1984b) were redefined as twelve sites. In the process, some sites were de-classified because they were determined to be natural features, additional sites were added, and five sites received changed National Register evaluations. Three new sites were recorded in Section 4. For all nineteen sites, including trails, chipping stations, lithic scatters, rock rings, and cleared circles, four were considered National Register eligible and four were indeterminate. These eight sites were added to the list of cultural resources to be tested or receive data recovery that were specified in the CRMP.

In July 1986, BFMA completed a survey in the Gold Fields project area for an electrical transmission line (Schaefer 1986). This included an intensive survey of a one-mile long 750-foot wide substation siting area under an existing 161 kV line, two miles east of the Blythe-Ogilby Road. The survey also included a six-mile long by 100-foot wide corridor for the 92 kV transmission line that brings electricity from the substation to the mine processing plant site. The line is south of Glamis Road and runs through Sections 9, 10, 11, 12 (unsurveyed) of Township 13 South, Range 19 East, and through Sections 7, 8, and 18, of Township 13 South, Range 20 East. The transmission line substation survey was in Section 8 and 17 of Township 13 South, Range 20 East. Four sites and two isolates were recorded in this survey, ranging from a quarry locality, a chipping station, rock ring, and a multiple use temporary camp area. All of the sites were evaluated as National Register eligible. Two sites were mitigated through documentation and avoidance while impacts to two sites, the quarry at the west end of the line and temporary camp at the east end within the substation area, were mitigated through data recovery.

As part of the 1986 Gold Fields study, a surface geomorphology study of the Mesquite district was completed by Michael Waters (Schaefer 1986:Appendix A). This included examination of the various desert pavement formations and attempts to relatively date these surfaces.

By July 1986, a total of 100 sites had been recorded in the Gold Fields project area, of which most were lithic scatters. After eliminating those sites that were not National Register eligible or that were avoided through project planning and protection measures, a total of 16 sites remained that required testing or data recovery. Data from these sites were used for analysis of lithic assemblages and features to address questions of hunter-gatherer settlement and subsistence patterns (Schaefer 1986). The study focused on the large array of chipping stations, lithic scatters, and a small sample of rock rings and cleared circles found in the area. The results supported a model of specialized resource exploitation, high mobility, and short-term occupation of this marginal desert environment by

logistically organized groups who were most likely based on the Colorado River, Lake Cahuilla shoreline, or other locations with more reliable water, plant, and animal resources.

A 1,835 acre inventory was completed in July 1987 in an area just northeast of the current project area (Cook and Underwood 1987). This study included parts or the entirety of Sections 2, 3, 4, 10, and 11 of Township 13 South, Range 19 East. In all, 12 sites were identified. Only two sites were considered eligible for inclusion on the National Register.

Two small areas at the northeast and southeast edges of Brownie Hill were inventoried by BLM archaeologist Pat Welch (1987). This included a ten-acre parcel around a hill known as Little Sister and a four-acre corridor known as Mack. Nine sites and seven isolates were recorded, all being small chipping stations or isolated debitage. None were considered National Register eligible.

Also during 1987, a cultural resource inventory of the proposed Highway 78 realignment was completed by Cook. In November, 1987 a survey and evaluation was finished (Elling and Schaefer 1988) by BFMA on the Mesquite Mine Access Road alignment, the Highway 78 realignment, a diversion channel, and portions of Brownie Hill. The survey resulted in the documentation of 20 sites and 44 isolates. All the sites, except one, were chipping stations or lithic scatters and all the isolates were flakes, core bifaces, or cores. Due to the limited artifact counts and artifact variability, none of the sites were considered National Register eligible. Some collection was recommended to augment the Gold Fields data base and research.

In November of 1987, 160 acres were surveyed in the Brownie Point area (Elling and Schaefer 1988). An additional 75 acres were examined in an area south of the old Highway 78 on and near Alice-June Hill. Throughout the two survey areas a total of 40 sites and 33 isolates were located. The vast majority of sites found during the survey included lithic scatters and chipping stations, mostly located on the hillslopes and hilltops of Brownie Hill and Alice June Hill. These sites contained chalcedony and some basalt cores, flakes, and debitage. Two sites were trail segments and one was a rock ring. The most significant sites were one large quarry atop Brownie Hill and a rock art site found on the northwestern slope of Thunderbird Hill, just northeast of Alice-June Hill.

As part of the Alice-June Hill project, testing was completed on several World War II military sites (Elling and Schaefer 1988:Addendum A). The camps consisted of a number of dispersed campfires, circular or rectangular pits with rocky berms, several can dumps, and tent pad clearings. The camps were photographed, mapped, and surface collected. Testing was done at a number of the features.

In July 1988, BLM archaeologist Pat Welch conducted an inventory of the Gold Fields proposed Leach Pad 4, a 130 acre area south of Alice June Hill. A total of five sites were examined, three of which were newly discovered. These included a WWII military camp, three chipping station sites, and a rock ring. None of the sites were considered eligible for the National Register.

Lithic studies of various sites in the Gold Fields area have been the subject of a number of recent reports (Schaefer 1987; Shackley 1988, 1989). Close to 10,000 pieces of debitage, cores, and bifaces have been analyzed. These and other studies have provided valuable data and analysis toward understanding technology and procurement strategies for the area.

Data recovery on an early 20th century placer mining camp was completed in 1989 (Shackley and Van Wormer 1989). This study included the identification and analysis of some 1,655 historic artifacts from a temporarily occupied mining camp dating from the turn of the century and worked by Mexican miners.

To date over 15 reports and studies have been conducted within the Mesquite/Gold Fields project area. Most have been survey and inventory studies with a number being devoted to various data recovery projects. Major research questions have been addressed within these reports including hunter-gather settlement patterns, lithic procurement strategies, historic use of the area, as well as WWII activities.

B. Field Methods

The present field survey was limited to areas that had not been examined in previous studies (see Figure 3). This entailed a pedestrian survey of approximately 3,000 acres. In addition, some previously surveyed areas were reexamined to re-evaluate some sites. A staked 500 foot wide rail corridor extending from the existing Southern Pacific rail line near Glamis to the project area was also surveyed using similar methods. Field work was conducted for two weeks in February and March of 1992, with a crew of four to five persons. The 20 meter interval transects were aligned to parallel the east and west boundaries of sections, and determined by compass and landmark orientation. A measured pace of meters was kept to help in determining location. Biodegradable toilet paper was used to mark the edge of each transect as the crew traversed the study area. On the return trip, the line was followed insuring that full coverage of an area was maintained. This procedure assured excellent coverage in the relatively featureless terrain. Surface visibility was good.

Gold Fields Operating Company provided excellent quality, large scale topographic maps and aerial photos of the project area. These enabled the archaeologists to make precise plots of the cultural resources. All sites and isolates were plotted directly on these maps and recorded on site forms based on guidelines provided by the California Department of Parks and Recreation. Each site was recorded and mapped using standard methods. At larger sites each artifact or cluster was marked using pin-flags to identify both resources and site boundaries. Site information was then recorded and plotted on the maps. A site sketch map was also drawn and appropriate photo documentation completed. Finished archaeological site records appear in Appendix A (Volume II) of this report. Previously recorded site records appear in Appendix B (Volume II).

Archaeological site definitions follow guidelines defined by the Bureau of Land Management and the Office of Historic Preservation: a site is the location of associated artifacts or a feature, regardless of temporal placement or complexity. Minimally, a site must meet two criteria: 1) it must consist of at least three associated artifacts or a single feature, and 2) a site must be at least 45 years old. The age of a site may be determined by artifact evidence, documentary evidence, or similarity of the site to others that have been firmly dated. A minimum 50 meter area with no artifacts was used to separate artifact clusters into distinct sites. Artifact clusters closer than 50 meters were defined as loci of one site.

IV. RESULTS

The following portion of the report presents a site by site inventory of the Mesquite Landfill Project area. Site information is determined from a variety of sources including the current 3,000 acre survey, previous studies and evaluations, as well as other sources. With the completion of this report the entire Mesquite Landfill project area has been inventoried using Class III standards. As an appendix to the EIS for the proposed Mesquite Landfill Project, the results section below and following recommendations section discuss the current and recommended National Register status of affected cultural resources. Sites with current National Register (NR) statuses have been evaluated during prior Gold Fields projects discussed above. Actual determinations of Eligibility and Effect resulted from BLM consultation with SHPO in accordance with Section 106 of the National Historic Preservation Act and a programmatic agreement in effect for BLM actions in the State of California. Recommendations for National Register status are herein provided by the authors for previously untreated sites or sites for which re-evaluations are suggested. Actual determinations of Eligibility and Effect for these sites must be made by BLM in consultation with SHPO.

A total of 58 sites and 14 isolates have been recorded for the Mesquite Landfill Project area, including two redefined or expanded previously recorded sites, 13 new sites, and five new isolates found during the current survey (Figures 4, 5, and 6). Of the sites within the Mesquite Landfill Project area, only CA-IMP-4983H, the historic Glamis/Blythe Wagon Road, is currently eligible for inclusion on the National Register of Historic Places and is also still preserved. Impacts to several of the other National Register eligible sites have been mitigated through previous studies connected with expansion of mining activities. Other sites were not considered significant and did not undergo data recovery prior to ground disturbance.

An inventory of all sites discussed in this document appears in Tables 1 through 3. In the NR Status column of Table 1, sites that have been previously evaluated in earlier projects are listed as potentially eligible (E) or not eligible (NE). Sites that had not previously been evaluated are listed as recommended eligible (RE) or recommended not eligible (RNE). Sites in which a change in evaluation is recommended show both the former status and recommended new status. Previously eligible sites that have undergone complete data recovery or that have been subsequently destroyed are recommended for reclassification as not eligible. To facilitate BLM and SHPO consultation, previously treated sites also are listed again in Table 2. New recommendations for National Register eligibility on previously untreated sites are listed in Table 3. Also included in Table 3 are sites for which revised evaluations are recommended. It is the sites listed in Table 3 for which BLM and SHPO consultation is required.

Surface geomorphology partially explains the distribution of sites. Most sites are located in the northern half of the project area, with the greatest density in the northwest quadrant. This is the area with the largest concentration of preserved desert pavement terraces. Lithic scatters are most likely to be preserved on these stabilized surfaces. The major trail and wagon road complex also passes through this area, adjacent to one of the larger wash systems. The southern portion is heavily dissected by braided Holocene stream channels that carry away most traces of human occupation.

TABLE 1
MESQUITE LANDFILL PROJECT
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-1881	trail segment	none	30	Pritchett 1977, site form	RE	CA-IMP-1976 is part of this trail.
CA-IMP-1886	rock ring and cleared circle	none	3	IVCM 1977, site form	RNE	
CA-IMP-1969	pottery scatter	50 sherds	2	Vogel 1977, site form	RNE	Site destroyed by grading activities.
CA-IMP-1971H (ML-11)	WWII bivouac area	no surface artifacts, fox holes, tent areas, rock rings	100,000	Schaefer/Pallette 1993	RNE	Site in same location as isolate, which was not relocated.
CA-IMP-1973	trail marker	none	1	Vogel 1977, site form	RNE	Site re-examined and determined to be of modern construction.
CA-IMP-1974	isolate	2 sherds	1	Vogel 1977, site form	RNE	
CA-IMP-1975	trail marker	none	1	Vogel 1977, site form	RNE	Modern cairn.
CA-IMP-1976	trail marker and trail	none	1+	Vogel 1977, site form	RE	Segment of CA-IMP-1881.
CA-IMP-1978	pottery scatter along trail	80 sherds	2	Vogel 1977, site form	RE	
CA-IMP-1979	trail and trail marker	none	1	Vogel 1977, site form	RE	Modern cairn also in vicinity.
CA-IMP-1987	lithic scatter	10 flakes and a hammerstone	1	Vogel 1977, site form	RNE	
CA-IMP-4637	trail and pot drops	sherd scatters	251 - 1,000	Steiner 1979, site form	RE	This trail is part of the old wagon trail CA-IMP-4983H.
CA-IMP-4979	trails and chipping stations	lithics	12,000	IVCM 1983, site form	RE	
CA-IMP-4983H (ML-14)	prehistoric trail and historic wagon road	historic glass and cans, 2 pot drops	10,000	IVCM 1983, site form Schaefer/Pallette 1993	E	Portions of this site have been preserved by the BLM. Southern extension of trail is recorded as CA-IMP-5082.
CA-IMP-4986	rock ring	none	36	IVCM 1983, site form Schaefer/Elling 1987	NE	Recommended not eligible by Schaefer/Elling in 1987.

TABLE 1
MESQUITE LANDFILL PROJECT
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-4987H	WWII artifact scatter	1942, 24 gal. can lid (collected), 2 shell casings	25	IVCM 1983, site form	RNE	Probably part of CA-IMP-5905H.
CA-IMP-4989	rock ring	1 chalcedony flake	25	IVCM 1983, site form Schaefer 1986	NE	Mitigated by data recovery.
CA-IMP-4990	low density lithic scatter, chipping stations, and a rock ring.	numerous flakes and other debitage	60,000	IVCM 1983, site form Schaefer 1986	RNE	Mitigated by data recovery.
CA-IMP-4991	rock ring	core and 3 flakes	25	IVCM 1983, site form	NE	Site no longer exists.
CA-IMP-4992	chipping station	50+ flakes of brown chalcedony, hammerstone	8	IVCM 1983, site form Schaefer 1986	RNE	Mitigated by data recovery.
CA-IMP-4993	rock ring	none	2	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4994	rock ring	none	2	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4995	rock ring	none	9	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4996	rock ring	none	25	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4997	rock ring	none	25	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4998	low density lithic scatter and chipping station.	40+ flakes, 11 core fragments, hammerstone	525	IVCM 1983, site form Schaefer 1986	RNE	Mitigated by data recovery.
CA-IMP-4999	chipping station	1 core, 23 flakes	520	IVCM 1983, site form	NE	Site no longer exists.
CA-IMP-5000	rock alignment	none	600	IVCM 1983, site form Schaefer 1986	NE	Tested for significance and found to be modern.
CA-IMP-5001	rock ring	none	9	IVCM 1983, site form	RNE	
CA-IMP-5031	chipping station and rock ring	33 flakes	8	IVCM 1983, site form	RNE	

TABLE 1
MESQUITE LANDFILL PROJECT
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-5082	cleared circles - WWII tent pads, trail	None	8	IVCM 1984, site form	RE	Cleared circles are WWII tent sites and prehistoric trail is an extension of CA-IMP-4983H.
CA-IMP-5384	isolate	isolated red chalcedony core	1	Cook 1987, site form	NE	
CA-IMP-5614	isolate	isolated chalcedony flake	1	IVCM 1983, site form	NE	
CA-IMP-5615	isolate	isolated flake	1	IVCM 1983, site form	NE	
CA-IMP-5872H	WWII bivouac area	cans, glass, bottles	20,000	Elling/Schaefer 1988:Appendix A	NE	Site was tested and documented by Elling and Schaefer in 1988
CA-IMP-5874	isolate	2 secondary chalcedony flakes	1	Elling/Schaefer 1988	NE	
CA-IMP-5875	isolate	1 chalcedony primary flake	1	Elling/Schaefer 1988	NE	
CA-IMP-5877H	WWII bivouac area	2 rifle shells	4	Elling 1988	NE	
CA-IMP-5878H	WWII bivouac area	some tin cans and rifle shells	12,000	Elling 1988	NE	
CA-IMP-5879	isolate	chert flake	1	Elling 1988	NE	
CA-IMP-5880	isolate	white chalcedony primary flake	1	Elling 1988	NE	
CA-IMP-5905H	WWII bivouac area	tin cans, rifle shells	108,000	Welch 1988	NE	Archaeological inventory of leach pad #4.
CA-IMP-5906	2 chipping stations	40+ flakes of red chert	37.5	Welch 1988	NE	Archaeological inventory of leach pad #4.
CA-IMP-5907	rock ring	none	9	Welch 1988	NE	Archaeological inventory of leach pad #4.
CA-IMP-5966	rock ring	none	3	Shackley 1989	NE	
CA-IMP-5967	chipping station	5 red jasper flakes	1	Shackley 1989	NE	

TABLE 1
MESQUITE LANDFILL PROJECT
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-5968	chipping station	core and 17+ flakes of red jasper	17.5	Shackley 1989	NE	
CA-IMP-5969	chipping station	core and 9 flakes red jasper	7	Shackley 1989	NE	
CA-IMP-5970	trail	none	305	Shackley 1989	NE	
CA-IMP-5971	large lithic scatter	500+ flakes and 14 cores	124,300	Shackley 1989	NE	
CA-IMP-5972	chipping station	core and 4 flakes	1	Shackley 1989	NE	
CA-IMP-5973	isolate	one agate flake	1	Shackley 1989	NE	
CA-IMP-6645H (ML-1)	WWII can dump	100+ cans, bottle	100,000	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6686 (ML-2)	chipping station	3 core frags and 12 flakes chalcedony	1	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6687 (ML-3)	chipping station	100+ flakes	2	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6688 (ML-4)	chipping station	core frag. and 13 flakes red jasper	35	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6689 (ML-5)	chipping station	17 white chalcedony flakes	1	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6690 (ML-6)	chipping station	3 cores, 12 yellow chalcedony debitage	1	Schaefer/Pallette 1993	RNE	Current survey

TABLE 1
MESQUITE LANDFILL PROJECT
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-6691 (ML7)	2 chipping stations	Sta. #1: 7 flakes, Sta. #2: 2 core frags and 5 flakes	900	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6692H (ML-8)	WWII bivouac area	one rifle shell	9000	Schaefer/Pallette 1993	RNE	Probably part of CA-IMP-5872H
CA-IMP-6693 (ML-9)	chipping station	5 chalcedony flakes	8	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6694 (ML-10)	2 chipping stations	Sta. #1: 60 flakes, 5 cores; Sta. #2: 3 chalcedony flakes	100	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6695 (ML-12)	trail intersection and 2 pot drops	Pd. #1: 5 sherds, Pd. #2: 100+ sherds	100+	Schaefer/Pallette 1993	RE	Current survey
CA-IMP-6696 (ML-13)	trail, two chipping stations and two rock rings	Sta. #1: jasper core and 2 sec. flakes, Sta. #2: 50+ flakes of yellow chalcedony	2,800	Schaefer/Pallette 1993	RE	Current survey
CA-IMP-6697H (ML-15)	WWII bivouac area	rifle shells	250	Schaefer/Pallette 1993	RNE	
CA-IMP-6698 (ML-16)	Chipping station	10 interior brown chalcedony flakes	1	Schaefer/Pallette 1993	RNE	Current rail spur survey

* Key: E = Previously determined or recommended NR eligible.
NE = Previously determined or recommended not NR eligible.
RE = Recommended NR eligible in this report.
RNE = Recommended not NR eligible in this report.

TABLE 2
PREVIOUSLY EVALUATED
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-4983H (ML-14)	prehistoric trail and historic wagon road	historic glass and cans, 2 pot drops	10,000	IVCM 1983, site form Schaefer/Pallette 1993	E	Portions of this site have been preserved by the BLM. Southern extension of trail is recorded as CA-IMP-5082.
CA-IMP-4986	rock ring	none	36	IVCM 1983, site form Schaefer/Elling 1987	NE	Recommended not eligible by Schaefer/Elling in 1987.
CA-IMP-4989	rock ring	1 chalcedony flake	25	IVCM 1983, site form Schaefer 1986	NE	Mitigated by data recovery.
CA-IMP-4991	rock ring	core and 3 flakes	25	IVCM 1983, site form	NE	Site no longer exists.
CA-IMP-4993	rock ring	none	2	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4994	rock ring	none	2	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4995	rock ring	none	9	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4996	rock ring	none	25	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4997	rock ring	none	25	IVCM 1983, site form	NE	Site destroyed by Leach Pad.
CA-IMP-4999	chipping station	1 core, 23 flakes	520	IVCM 1983, site form	NE	Site no longer exists.
CA-IMP-5000	rock alignment	none	600	IVCM 1983, site form Schaefer 1986	NE	Tested for significance and found to be modern.
CA-IMP-5384	isolate	isolated red chalcedony core	1	Cook 1987, site form	NE	
CA-IMP-5614	isolate	isolated chalcedony flake	1	IVCM 1983, site form	NE	
CA-IMP-5615	isolate	isolated flake	1	IVCM 1983, site form	NE	
CA-IMP-5872H	WWII bivouac area	cans, glass, bottles	20,000	Elling/Schaefer 1988:Appendix A	NE	Site was tested and documented by Elling and Schaefer in 1988
CA-IMP-5874	isolate	2 secondary chalcedony flakes	1	Elling/Schaefer 1988	NE	
CA-IMP-5875	isolate	1 chalcedony primary flake	1	Elling/Schaefer 1988	NE	
CA-IMP-5877H	WWII bivouac area	2 rifle shells	4	Elling 1988	NE	

TABLE 2
PREVIOUSLY EVALUATED
ARCHAEOLOGICAL SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-5878H	WWII bivouac area	some tin cans and rifle shells	12,000	Elling 1988	NE	
CA-IMP-5879	isolate	chert flake	1	Elling 1988	NE	
CA-IMP-5880	isolate	white chalcedony primary flake	1	Elling 1988	NE	
CA-IMP-5905H	WWII bivouac area	tin cans, rifle shells	108,000	Welch 1988	NE	Archaeological inventory of leach pad #4.
CA-IMP-5906	2 chipping stations	40+ flakes of red chert	37.5	Welch 1988	NE	Archaeological inventory of leach pad #4.
CA-IMP-5907	rock ring	none	9	Welch 1988	NE	Archaeological inventory of leach pad #4.
CA-IMP-5966	rock ring	none	3	Shackley 1989	NE	
CA-IMP-5967	chipping station	5 red jasper flakes	1	Shackley 1989	NE	
CA-IMP-5968	chipping station	core and 17+ flakes of red jasper	17.5	Shackley 1989	NE	
CA-IMP-5969	chipping station	core and 9 flakes red jasper	7	Shackley 1989	NE	
CA-IMP-5970	trail	none	305	Shackley 1989	NE	
CA-IMP-5971	large lithic scatter	500+ flakes and 14 cores	124,300	Shackley 1989	NE	
CA-IMP-5972	chipping station	core and 4 flakes	1	Shackley 1989	NE	
CA-IMP-5973	isolate	one agate flake	1	Shackley 1989	NE	

TABLE 3
RECOMMENDED EVALUATIONS OF UNTREATED SITES AND RE-EVALUATIONS OF PREVIOUSLY TREATED SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-1881	trail segment	none	30	Pritchett 1977, site form	RE	CA-IMP-1976 is part of this trail
CA-IMP-1886	rock ring and cleared circle	none	3	IVCM 1977, site form	RNE	
CA-IMP-1969	pottery scatter	50 sherds	2	Vogel 1977, site form	RNE	Site destroyed by grading activities
CA-IMP-1971H (ML-11)	WWII bivouac area	no surface artifacts, fox holes, tent areas, rock rings	100,000	Schaefer/Pallette 1993	RNE	Site in same location as previously recorded isolate, which was not relocated.
CA-IMP-1973	trail marker	none	1	Vogel 1977, site form	RNE	Site re-examined and determined to be of modern construction
CA-IMP-1974	isolate	2 sherds	1	Vogel 1977, site form	RNE	
CA-IMP-1975	trail marker	none	1	Vogel 1977, site form	RNE	Modern cairn
CA-IMP-1976	trail marker and trail	none	1+	Vogel 1977, site form	RE	Segment of CA-IMP-1881
CA-IMP-1978	pottery scatter along trail	80 sherds	2	Vogel 1977, site form	RE	
CA-IMP-1979	trail and trail marker	none	1	Vogel 1977, site form	RE	Modern cairn also in vicinity.
CA-IMP-1987	lithic scatter	10 flakes and a hammerstone	1	Vogel 1977, site form	RNE	
CA-IMP-4637	trail and pot drops	sherd scatters	251 - 1,000	Steiner 1979, site form	RE	This trail is part of the old wagon trail CA-IMP-4983H.
CA-IMP-4979	trails and chipping stations	lithics	12,000	IVCM 1983, site form	RE	
CA-IMP-4983H (ML-14)	prehistoric trail and historic wagon road	historic glass and cans, 2 pot drops	10,000	IVCM 1983, site form Schaefer/Pallette 1993	E	Portions of this site have been preserved by the BLM. Southern extension of trail is recorded as CA-IMP-5082.
CA-IMP-4987H	WWII artifact scatter	24 gal. can lid (collected), 2 shell casings	25	IVCM 1983, site form	RNE	Probably part of CA-IMP-5905H; Chronology: 1942.
CA-IMP-4990	low density lithic scatter, chipping stations, and a rock ring.	numerous flakes and other debitage	60,000	IVCM 1983, site form Schaefer 1986	RNE	Mitigated by data recovery.

TABLE 3
RECOMMENDED EVALUATIONS OF UNTREATED SITES AND RE-EVALUATIONS OF PREVIOUSLY TREATED SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-4992	chipping station	50+ flakes of brown chalcedony, hammerstone	8	IVCM 1983, site form Schaefer 1986	RNE	Mitigated by data recovery.
CA-IMP-4998	low density lithic scatter and chipping station.	40+ flakes, 11 core fragments, hammerstone	525	IVCM 1983, site form Schaefer 1986	RNE	Mitigated by data recovery.
CA-IMP-5001	rock ring	none	9	IVCM 1983, site form	RNE	
CA-IMP-5031	chipping station and rock ring	33 flakes	8	IVCM 1983, site form	RNE	
CA-IMP-5082	cleared circles - WWII tent pads, trail	None	8	IVCM 1984, site form	RE	Cleared circles are WWII tent sites and prehistoric trail is an extension of CA-IMP-4983H. The prehistoric component is recommended for eligiblility.
CA-IMP-6645H (ML-1)	WWII can dump	100+ cans, bottle	100,000	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6686 (ML-2)	chipping station	3 core frags and 12 flakes chalcedony	1	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6687 (ML-3)	chipping station	100+ flakes	2	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6688 (ML-4)	chipping station	core frag. and 13 flakes red jasper	35	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6689 (ML-5)	chipping station	17 white chalcedony flakes	1	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6690 (ML-6)	chipping station	3 cores, 12 yellow chalcedony debitage	1	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6691 (ML-7)	2 chipping stations	Sta. #1: 7 flakes, Sta. #2: 2 core frags and 5 flakes	900	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6692H (ML-8)	WWII bivouac area	one rifle shell	9000	Schaefer/Pallette 1993	RNE	Probably part of CA-IMP-5872H

TABLE 3
RECOMMENDED EVALUATIONS OF UNTREATED SITES AND RE-EVALUATIONS OF PREVIOUSLY TREATED SITES

Site Number	Site Type	Artifacts	Area m^2	Reference	Current NR Status	Comments
CA-IMP-6693 (ML-9)	chipping station	5 chalcedony flakes	8	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6694 (ML-10)	2 chipping stations	Sta. #1: 60 flakes, 5 cores; Sta. #2: 3 chalcedony flakes	100	Schaefer/Pallette 1993	RNE	Current survey
CA-IMP-6695 (ML-12)	trail intersection and 2 pot drops	Pd. #1: 5 sherds, Pd. #2: 100+ sherds	100+	Schaefer/Pallette 1993	RE	Current survey
CA-IMP-6696 (ML-13)	trail, two chipping stations and two rock rings	Sta. #1: jasper core and 2 sec. flakes, Sta. #2: 50+ flakes of yellow chalcedony	2,800	Schaefer/Pallette 1993	RE	Current survey
CA-IMP-6697H (ML-15)	WWII bivouac area	rifle shells	250	Schaefer/Pallette 1993	RNE	
CA-IMP-6698 (ML-16)	Chipping station	10 interior brown chalcedony flakes	1	Schaefer/Pallette 1993	RNE	Current rail spur survey

* Key: E = Previously determined or recommended NR eligible.
NE = Previously determined or recommended not NR eligible.
RE = Recommended NR eligible in this report.
RNE = Recommended not NR eligible in this report.

Figure 4 - Previously Recorded Archaeological Sites (Confidential - See Volume II)

Figure 5 - Newly Recorded Sites (Confidential - See Volume II)

Figure 6 - Map Showing Rail Spur Sites (Confidential - See Volume II)

The paucity of lithic materials in these shallow, sandy washes also account for the lack of lithic scatters and chipping stations that tend to occur only on remnant quaternary desert pavements that remain between the wide wash systems.

Site types include chipping stations, lithic scatters, rock rings and alignments, historic/prehistoric trails and pot drops, and World War II training activity areas. Table 1 provides a condensed version of the site types and National Register eligibility. Each site is briefly described below by site type, current status, or recommended status. The reader is referred to the various reports, as well as site records, for more detail.

A. Chipping Stations/Lithic Scatters

Over fifty percent of the sites recorded in the Mesquite/Gold Fields area have to do with lithic procurement. Several studies (Shackley 1989, 1988; Schaefer1986, 1985) have determined that the area was used extensively during prehistoric times for lithic quarrying activities, resulting in the thousands of chipping stations and lithic scatters found throughout the area. A large number of these sites have been the subject of various data recovery projects. Many of these sites show evidence of test knapping of the various chalcedony and jasper nodules and volcanic boulders found in the desert pavement. Sites often consist of one or two chipping stations in a limited area with a predominance of secondary and angular debris in the lithic assemblage, suggesting the test knapping of cores and the subsequential removal of useable material. The lithic procurement assemblage within the project area indicate a very homogeneous and redundant collection characterized by core test knapping and core reduction for transportation to residential bases or at least workshops elsewhere. Only reduced cores and debitage, indicative of very primary reduction, are usually found throughout the area. Numerous recovered broken core bifaces were interpreted to be specially prepared cores for systematic flake removal. Virtually no finished core based tools were found.

CA-IMP-1987

Originally recorded by Vogel in 1977, this site is described as a lithic scatter of ten pieces of yellow chert located on desert pavement. This site could not be located during the present survey and may have been destroyed by off-road activity. In any event, it would have been recommended to be not NR eligible because it offers no additional information not previously obtained from the data recovery of numerous other lithic scatters in the Gold Fields area.

CA-IMP-4990

This was an extensive, low density lithic scatter of five chipping stations, a rock ring, and an amorphous rock ring complex located on a slightly raised, very old Pleistocene terrace. The site had been determined to be NR eligible and impacts from the Mesquite Mine project were mitigated through data recovery (Schaefer 1986:37). The scientific significance of the site has been expended and it is recommended that the status be changed to not NR eligible.

CA-IMP-4992

A chipping station was located on a moderately old Pleistocene terrace. Lithics included over 50 brown chalcedony flakes. The site was originally determined NR eligible and data recovery was completed for the Mesquite Mine project (Schaefer 1986:41). As a result, it is recommended that the site is no longer NR eligible.

CA-IMP-4998

A dispersed low-density lithic scatter with a possible chipping station was located on a low ridge. The site had over 40 flakes of chalcedony. The site was originally determined NR eligible and data recovery was completed for the Mesquite Mine project (Schaefer 1986:41).

CA-IMP-4999

This chipping station consisted of one core fragment and 23 flakes of fine grained basalt. It was originally recorded by the Imperial Valley College Museum but no final NR evaluation was completed at that time. The site has since been destroyed by off road activity and no longer exits. It is therefore recommended to be not NR eligible.

CA-IMP-5031

This chipping station consisted of 33 flakes of jasper with an associated rock ring. This site was not relocated during subsequent surveys. Based on site records, however, it is recommended that this site not be considered NR eligible because it contains no diagnostic points or blanks and contains no additional information that is important to interpreting the prehistory of the area.

CA-IMP-5906

Two chipping stations were recorded on a desert pavement area. One is composed of 39 flakes and several core fragments of rhyolite. The other is described as a red chert chipping station with over 40 flakes. Welch (1988) recorded the site for proposed Leach Pad No. 4 and determined it was not NR eligible.

CA-IMP-5967

This site consisted of five pieces of jasper debitage scattered over a one meter area that was studied for leach pad and access road locations in Section 16 and determined not to be NR eligible (Shackley 1989:10).

CA-IMP-5968

Similar to CA-IMP-5967, this site consisted of one core and 17 pieces of red debitage on a desert pavement area. It was subjected to in-field lithics analysis during Section 16 leach pad survey and determined not to be NR eligible based on in-field sparse lithic scatter analysis (Shackley 1989:10).

CA-IMP-5969

This site consisted of one jasper core and nine primary jasper flakes covering an area of 7m². Apparently this site represented test knapping of a jasper core. Shackley (1989:12), in his Section 16 leach pad survey assessed this site as not NR eligible.

CA-IMP-5971

The largest site discovered during the Section 16 leach pad survey, this site consisted of a light density core/debitage scatter over a 124,800 m² area. In-field lithics analysis led to an evaluation that this site was not NR eligible (Shackley 1989:12).

CA-IMP-5972

The site consisted of one large jasper core with four flakes. The core was test knapped, six flakes removed, and two were transported elsewhere. Discovered during the Section 16 leach pad survey, it was not considered NR eligible (Shackley 1989:23).

CA-IMP-6686 (ML-2)

A chipping station with three core fragments and 12 flakes of chalcedony, located on a poorly developed Holocene pavement, was found during the current study. It is recommended that this site be considered not eligible for NR inclusion.

CA-IMP-6687 (ML-3)

This chipping station, discovered during the present survey, consists of over 100 flakes and core fragments of various chalcedony material. Seventy-five percent of the flakes exhibit some amount of cortex (Figure 7a). Artifacts are lying on top of the desert pavement. This station was consistent with similar ones found in the area that appeared to be test knapping of chalcedony nodules found in the desert pavement. This site contains no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. It is therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. It is therefore recommended that it be considered not NR eligible.

CA-IMP-6688 (ML-4)

The present survey discovered a chipping station with a core fragment and 13 flakes of red jasper was found on a desert pavement area. Flake types include seven secondary, three interior, and one primary. The debitage was moderately embedded in the surface of the pavement. This site contains no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. It is therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. It is therefore recommended that it be considered not NR eligible.

Chipping Station - Site IMP-6682
(5cm Intervals on Scale)

Chipping Station - Site IMP-6690
(5cm Intervals on Scale)

Brian F. Mooney Associates

Figure 7

CA-IMP-6689 (ML-5)

This chipping station, discovered during the present survey, consists of nine secondary, three primary, and five interior flakes of white chalcedony moderately embedded in a desert pavement area. The debitage is moderately patinated. This site contains no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. It is therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. It is therefore recommended that it be considered not NR eligible.

CA-IMP-6690 (ML-6)

This chipping station, discovered during the present survey, contained debitage that came from a very poor quality nodule of yellow/gold chalcedony (see Figure 7). Artifacts were well embedded in the pavement and exhibited considerable patination. Debitage included three core fragments, ten pieces of angular debris, and two interior flakes. This site contains no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. It is therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. It is therefore recommended that it be considered not NR eligible.

CA-IMP-6691 (ML-7)

During the current survey, two chipping stations with a small drainage between them were located on a desert pavement area. Station 1 had seven pieces of debitage including three angular debris, three interior, and one secondary flake of waxy grey chalcedony. All artifacts are well patinated and well embedded in the pavement. Station 2 was located 17 meters to the east and consists of two core fragments, and five pieces of angular debris of yellow/gold chalcedony lying on top of the pavement. Both chipping stations contain no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. They are therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. This site is therefore considered not NR eligible.

CA-IMP-6693 (ML-9)

A chipping station was found on a well developed Pleistocene desert pavement area. The artifacts consist of three interior and two secondary flakes of yellow/gold chalcedony. Each flake shows evidence of moderate patination. This site contains no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. It is therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. It is therefore recommended that it be considered not NR eligible.

CA-IMP-6694 (ML-10)

The present survey revealed two chipping stations located on a well developed Pleistocene desert pavement area. Station 1 has 60± pieces of debitage of yellow/gold chalcedony, including five core fragments, 30 secondary, and 30 interior flakes. Station 2 was 15 meters west of Station 1 and has three large secondary flakes of chalcedony that are extremely well patinated. Both chipping stations

contain no additional lithic types or materials, or other characteristics that distinguish it from previously examined lithic scatters. They are therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. This site is therefore considered not NR eligible.

CA-IMP-6698 (ML-16)

During the current survey, a chipping station was discovered that consists of ten interior flakes of brown chalcedony on poorly developed Holocene pavement. Very little patination was evident on the flakes. This site contains no additional artifact or other characteristics that distinguish it from previously examined lithic scatters. It is therefore not likely to produce new scientific information or add to existing knowledge of the prehistory of the area. It is therefore recommended that it be considered not NR eligible.

Isolated flakes and cores

CA-IMP-1971	-	chert flake *	CA-IMP-5880	-	primary chalcedony flake
CA-IMP-5384	-	red chalcedony core	CA-IMP-5973	-	agate flake
CA-IMP-5614	-	chalcedony flake	CA-IMP-6699-I (ML-17)	-	chalcedony core
CA-IMP-5615	-	flake	CA-IMP-4977-I (ML-18)	-	secondary chalcedony flake*
CA-IMP-5874	-	2 secondary chal. flakes	CA-IMP-6700-I (ML-19)	-	secondary jasper flake
CA-IMP-5875	-	chalcedony primary flake	CA-IMP-6701-I (ML-20)	-	secondary chalcedony flake
CA-IMP-5879	-	chert flake	CA-IMP-6702-I (ML-21)	-	primary jasper flake

* Updated

B. Rock Rings and Alignments

Cleared circles and rock ring alignments are very common in the western Sonoran Desert (Stone 1986:105-108; Carrico and Quillen 1982; Pendleton 1986) (Figure 8). In the Picacho Basin to the south of the study area, 210 cleared areas were recorded at 27 sites (Pendleton 1986:175). Based on an extensive excavation and recording program, Pendleton concluded that the function of the features could not be determined (1986:180). They could variously be temporary dwelling boundaries, the results of plants growing in the center, the result of local hydrology, clearings for lithic reduction, or any number of unknown factors. The association with other cultural material in Pendleton's study was equivocal, and no subsurface content could be discerned. Pendleton concluded that a vast majority of "the recorded cleared circles are natural rather than cultural in origin" (1986:180). Cleared areas as a result of WWII bivouac activities are not uncommon in the Mesquite/Gold Fields area. These are often rectangular or round in shape and have little or no redevelopment of desert pavement in the center. A number of these kinds of sites have been mistakenly recorded as prehistoric sites.

Schaefer (1986:67-86) has studied 15 circular arrangements or rock rings at nine sites located in the Gold Fields/Mesquite area. Schaefer attempted to determine if rock rings and cleared circles were possibly the remains of temporary encampments, the foundations of small shelters from which resource exploitation occurs, or food preparation, cooking, and consumption areas.

Rock Ring - IMP-6696, Looking North

Rock Ring - IMP-6696, Looking East

Brian F. Mooney Associates

Figure 8

Presumably artifacts reflecting these kinds of activities would be present at these types of sites. He found that assemblages near rock rings did not contain tools or utilized flakes that might be associated with household maintenance, but rather lithics were characteristic of the primary quarry and reduction activities found throughout the general area.

CA-IMP-1886

This "house ring with adjacent cleared circle" was recorded by IVCM in 1977. At that time the area had undergone moderate water erosion. The current survey found the ill-formed rock ring to still be present and the cleared circle to be amorphous at best. The site offers no additional research potential and it is recommended that it be considered not eligible for NR inclusion.

CA-IMP-4986

A rock ring 2.5 meters in diameter was located on a flat desert pavement-covered alluvial terrace. Several military tent pads, tank tracks and mine claim cairns occur in the general area, as do several ambiguous cleared circles. No prehistoric artifacts were found in association with the rock ring. It is entirely possible that the ring may have been modern in construction. Examined by Elling and Schaefer (1988:33) during the survey of Brownie and Alice-June hills, the site was determined to lack variability of form or surface components, was adequately recorded, and was not considered significant or NR eligible.

CA-IMP-4989

IVCM originally recorded an approximately two meter diameter rock ring in 1983. The ring contained one brown chalcedony flake located in the center of the cleared circle. The site was determined to be not NR eligible as a result of testing (Schaefer 1985a). The results of the documentation were included in the final data recovery program for Mesquite Mine (Schaefer 1986:37).

CA-IMP-4991

Originally recorded by the IVCM in 1983, a rock ring was associated with a chalcedony core and three flakes. The site was evaluated and determined not to be eligible for NR status during the data recovery program at Mesquite Mine (Schaefer 1986). The site no longer exists due to impacts from leach pad construction.

CA-IMP-4993

In 1983, IVCM recorded a small rock ring, 1.2 meters in diameter, on a dark-brown varnished desert pavement area. No artifacts were noted. No documentation could be found for a previous evaluation although it is assumed the site was determined not NR eligible. The site no longer exists due to impacts from leach pad construction.

CA-IMP-4994

Site CA-IMP-4994 is a rock ring recorded by IVCM. It was determined not NR eligible, and destroyed during development of the Section 16 leach pad.

CA-IMP-4995

This IVCM recorded site consists of a small rock ring less than 0.5 meters in diameter that had no artifact associations. No documentation could be found for a previous evaluation although it is assumed the site was determined not NR eligible. The site no longer exists due to impacts from leach pad construction.

CA-IMP-4996

An IVCM recorded rock ring measuring 1.5 meters in diameter with no associated artifact. No documentation could be found for a previous evaluation although it is assumed the site was determined not NR eligible. The site no longer exists due to impacts from leach pad construction.

CA-IMP-4997

An IVCM recorded rock ring with a center of small pebbles, approximately 2.5 meters in diameter was located on a desert pavement area. No documentation could be found for a previous evaluation although it is assumed the site was determined not NR eligible. The site no longer exists due to impacts from leach pad construction.

CA-IMP-5000

This site is a 25.1 meter long rock alignment that was located on a gently sloping terrace. No artifacts were associated with the site. Originally recorded by IVCM in 1983, Schaefer (1986:86) re-examined the site for the Mesquite Mine project and determined "that this alignment is primarily a recent phenomenon, possible associated with historic mining activities, mapping, or aerial surveying". The site was therefore recommended as not NR eligible.

CA-IMP-5001

A 2.3 meter diameter rock ring with no artifacts was discovered by IVCM in 1983. The site could not be relocated during the present survey and is presumed to no longer exist. In any event, it is recommended that this isolated rock ring should not be considered NR eligible because it lacks associated artifacts or features and contains no information not previously collected during data recovery of similar features in the Gold Fields project area.

CA-IMP-5907

The site, recorded for the Leach Pad No. 4 project by Welch (1988), consists of an isolated rock ring three meters in diameter located on desert pavement adjacent to a wash. It was determined to be not NR eligible.

CA-IMP-5966

This cleared rock circle measured 1.5 meters in diameter. It appears that the stones making up the center were removed and placed along the edge, forming a ring. No other cultural material was found in association with the feature. Shackley (1989:8) evaluated the site for the Section 16 leach pad project and concluded that it did not meet NR eligibility criteria. The site no longer exists due to leach pad construction.

CA-IMP-6696 (ML-13)

During the current survey, two rock rings were located on the south side of a wash in a desert pavement area. Two chipping stations were also noted. Both rings, composed of rocks with well developed varnish, were well embedded in the pavement (see Figure 8). A trail and two chipping stations are associated with the rings. It is recommended that this site be considered NR eligible because of multiple feature associations and that mitigation of impacts be accomplished through data recovery and implementation of a treatment plan.

C. Historic/Prehistoric Trails and Pot Drops

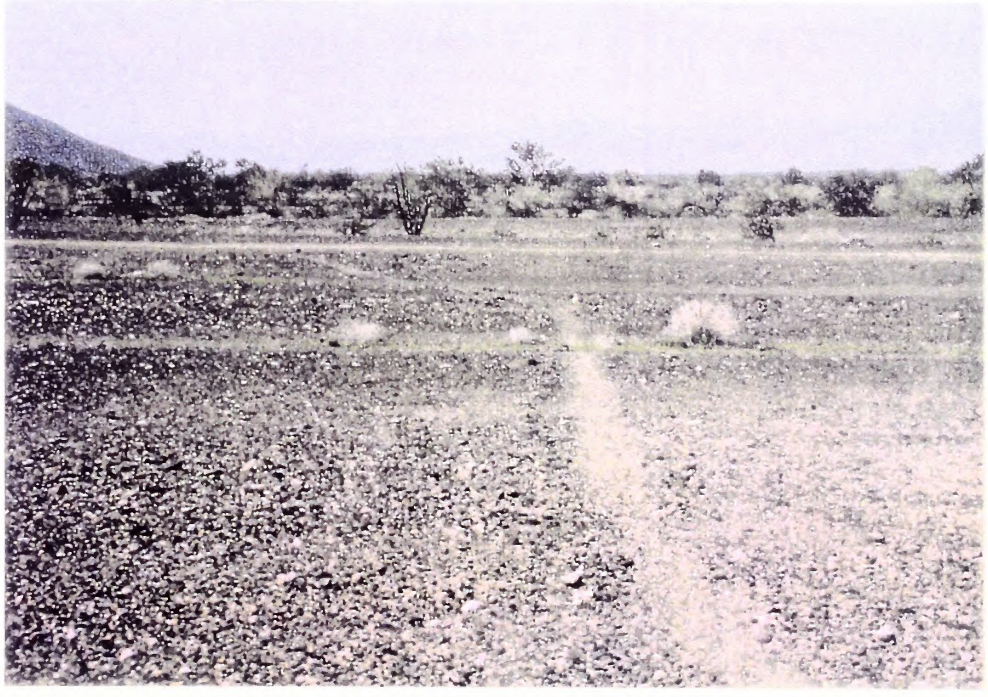
Numerous trails have been recorded in the Mesquite/Gold Fields Project area. Many of these trails are part of the Colorado River/Lake Cahuilla trail system. This system provided prehistoric routes between the major population centers along the Colorado River and ancient Lake Cahuilla. Indian Pass, just southeast of the project area, was a major route for aboriginal peoples. These trails extended across the desert pavement leaving distinct, well compacted paths that often have pot drops, rock alignments, cleared areas, chipping stations, and rock cairns in association. Such features, when found in direct physical association with prehistoric paths, have been recorded as part of the trail sites.

In historic times, a number of these trails were adapted as wagon roads for transportation of goods and people from the Colorado River to the coast. Mining activities in the Chocolate and Cargo Muchaco Mountains also opened up new roads. One such historic wagon trail can be found within the project area, CA-IMP-4983H or the Glamis/Blythe Wagon Road (Figure 9). This road is an extension of the Ogilby/Blythe Road, just a few miles to the northeast of the project area, that provided access to the many mines in the area as well as transportation between Blythe on the Colorado River and towns such as Ogilby and Brawley.

CA-IMP-1881/1976, -1969, -1973, -1974, -1975, -1978, -1979, -4637, -4979, and -6695 (ML-12)

Duplicate site numbers have been assigned to various segments of the same trail or trail complex, leading to the plethora of site numbers representing the prehistoric trail system in the northwestern periphery of the project area. Site CA-IMP-1881 and -1976 are segments of the same trail. Sites CA-IMP-1973 and -1975 were determined to be modern. Site CA-IMP-1969 was destroyed by grading activities. The site number designations are elements of a site complex that represents an east/west trail system extending from the same pass area as the Glamis/Blythe Road. Located just east of old Highway 78, these trail segments have occasional pot drops, rock rings, trail markers, and lithic scatters along them. WWII tank activities and off road vehicle tracks have impacted a number

Historic Wagon Road -IMP-4983H, Looking North



Trail Looking North - Site IMP-6695

Brian F. Mooney Associates

Figure 9

of these trails, but they still retain considerable integrity. All but the last segment were recorded by IVCM personnel in 1977 and 1983. It is recommended that this trail complex be considered NR eligible and impacts be mitigated through data recovery and implementation of a treatment plan.

CA-IMP-4983H (ML-14)

Approximately one mile of the historic Glamis/Blythe Wagon Road has been preserved and fenced off in accordance with an approved treatment plan (Schaefer 1985c). This portion was conveyed to Gold Field Mining Corporation via land exchange in 1986. An additional 0.5 miles of the wagon road was discovered during the current survey. This road follows a prehistoric trail, as evidenced by preserved segments of the trail that lie directly adjacent to the road. Pot drops and occasional lithics can be found along the trail. The southwestern extension of the prehistoric trail was previously recorded as site CA-IMP-5082. The historic wagon road is characterized by two deep wheel ruts, along with numerous late nineteenth and early twentieth century artifacts. Among historic items noted were tobacco tins, solder-sealed cans, sardine cans, purple glass bottles and ceramic sherds. The road begins at old Highway 78, in the current mining activity area, and runs southwest for about a mile. This section has been preserved by fencing. An additional segment (ML-14) is located southwest of the fenced area on the other side of a wash. It too has historic and aboriginal materials. BLM determined the site to be NR eligible in June 1984 during the Mesquite Mine project.

BLM submitted the determination to SHPO at that time and in accordance with the programmatic agreement, BLM assumed SHPO concurrence after SHPO did not respond and this was documented on September 13, 1984. It is recommended that mitigation of impacts be accomplished through implementation of a treatment plan.

CA-IMP-5082

IVCM originally recorded this site in 1984 as part of the Phase I, Class III survey for Gold Fields. Their site form described three cleared circles and an adjacent trail. The site did not receive a BLM/SHPO significance evaluation at that time. The current survey team relocated the site and determined that the cleared circles were WWII tent pads and the prehistoric trail is an extension of the prehistoric component of CA-IMP-4983H. As site CA-IMP-4983H is already determined eligible, it is recommended here that the prehistoric trail component of CA-IMP-5082 also be considered NR eligible and that mitigation of impacts be accomplished through data recovery. The three tent pads, however, are too limited and without other associations to warrant any additional treatment.

CA-IMP-5970

This possible prehistoric trail segment runs in a north/south direction for some 610 meters. No artifacts were found with the trail. Shackley (1989:12) determined that the trail had been adequately recorded during survey for the Section 16 leach pad project and was not recommended for NR eligibility. The site no longer exists due to impacts from leach pad construction.

CA-IMP-6696 (ML-13)

This site was previously discussed under rock rings in Section B. The site represents a segment of a prehistoric trail with two chipping stations and two rock rings located during the present survey

along the edge of a small drainage. Both rings, composed of rocks with well developed varnish, were well embedded in the pavement (see Figure 8). It is recommended that the site be determined NR eligible due to the presence of multiple feature associations, and that mitigation of impacts be accomplished through implementation of a treatment plan including data recovery.

D. World War II Activity Areas

The southwestern desert of California and western Arizona was the location of extensive training activities during WWII, as part of the Desert Training Center/California-Arizona Maneuver Area (DTC-CAMA). Large division camps were established in strategic locations and numerous, probably thousands, of smaller, special purpose camps or bivouacs were located throughout the desert.

Eight sites in the project area are associated with WWII training activities. Many of these are probably bivouac camps that were used temporarily during maneuvers. None have the features associated with more permanent long-term divisional camp sites. These temporary bivouac sites typically exhibit a complex arrangement of cleared areas, often rectangular in shape, that have been scraped into the desert pavement. Dug out holes or "fox holes" are often present as well as camp fires, rock cairns, and occasional rock walls. Tank and vehicle tracks are also present. Characteristic remains of these sites is the general lack of surface artifacts or trash.

CA-IMP-1971H (ML-11)

This large WWII bivouac area contains over 60 cleared areas, 30 fox holes, and several rock rings. Very little trash was evident as is commonly the case at WWII training camps. The newly recorded site occurs at the same location previously assigned to an isolated find recorded by Vogel in 1977. It was therefore given the same trinomial by IVCM. This complex assemblage of features provides some information on the organization of bivouacs and there is a potential to produce some subsurface trash pits and other features. In consultation with BLM, the site was seen to lack integrity of setting, feeling, and association that directly relates to the historic context of the DTC-CAMA. Archaeologically recovered information would also not contribute to our understanding of World War II training exercises, which have been documented in written records. It is therefore recommended that this site be considered not NR eligible.

CA-IMP-4987H

A small site with cleared areas may have been tent pads on a desert pavement area. Artifacts included shell casings and a trash can lid that was collected by IVCM in 1983 when they first recorded the site. This site may be part of CA-IMP-5905H, which Welch (1988) recommended as not NR eligible during the Leach Pad No. 4 project survey. It is recommended that the site be considered not NR eligible because of the limited remains.

CA-IMP-5872H

Elling and Schaefer (1986:Addendum A) previously recorded and tested a large complex that was located along the new Highway 78 right-of-way. They described a "field camp" with associated tent pad areas, fox holes, camp fires, and gun emplacements. Excavation of several camp fires that had been used as trash pits revealed a range of portable artifacts, consistent with field exercises. Elling

and Schaefer suggested that the study of these small camps may provide important information to activities associated with local, regional, and national history. The site, however, was not NR eligible because it failed to meet the minimum age requirement of 50 years old. Portions of the site were destroyed during the Highway 78 construction project, but intact sections remain. In consultation with BLM, it is recommended that the property remain not NR eligible because it lacks integrity of feeling, setting, and association.

CA-IMP-5877H

A WWII site contained four small dug out areas, each with a rocky berm or rock alignment in association. Some spent casings were noted, suggesting that this was a machine gun nest that protected a larger installation, perhaps site CA-IMP-5878H. Brian F. Mooney Associates recorded the site in February 1988 for a proposed extension of leach pads. BLM evaluated the site as not NR eligible because it failed to meet the minimum age requirement of 50 years (Elling, 1988: Addendum C). In consultation with BLM, it is recommended this site remain not NR eligible.

CA-IMP-5878H

This site consists of over twelve cleared areas, which were probable tent pad clearings, each associated with at least one fire pit. Some historic debris such as cans, rifle shells, and other rusted metal parts were nearby. Brian F. Mooney Associates recorded the site in February, 1988 for a proposed extension of leach pads. BLM evaluated this site as individually not NR eligible. In consultation with BLM, it is recommended this site remain not NR eligible.

CA-IMP-5905H

A large camp area with approximately 250 cleared areas was scraped in the desert pavement. There are at least eight camp fires and at least two small can dumps. The site has only a small number of artifacts. Welch (1988) recorded the site for proposed Leach Pad No. 4 and recommended that it was not NR eligible. In consultation with BLM, it is recommended this site remain not NR eligible.

CA-IMP-6645H (ML-1)

Discovered during the present survey, this possible can dump dating from WWII consists of over 100 artifacts including cans, bottles, and munitions casings. The site has been disturbed by construction activities and the cans are dispersed over a wide area. Lack of associated features makes it difficult to directly associate the material with specific military activities. It is therefore recommended that the site be considered not NR eligible.

CA-IMP-6692H (ML-8)

This camp, inventoried during the present survey, has at least ten fox holes, a number of camp fires, and tent foundation pads (Figure 10). It is probably part of the same activity area as site CA-IMP-5872H. Some information was gained from documenting the spatial association of features and based on previous tests at similar sites, there is some potential for recovering subsurface artifacts from camp fires and buried trash pits. In consultation with BLM, the site appears to lack integrity of setting, feeling and association that would contribute to the historic context of the DTC-CAMA.

WWII Bivouac Area - Site IMP-6692H
Showing Tent Pads Facing East

WWII Bivouac Area - Site IMP-6692H
"Foxholes", Facing East

Brian F. Mooney Associates

Figure 10

Archaeologically recovered information would not add significantly to our understanding of World War II training exercises. It is therefore recommended that this site be considered not NR eligible.

CA-IMP-6697H (ML-15)

This newly recorded WWII bivouac area includes two-to-three rectangular and circular cleared areas. A rock alignment and a possible hearth were also noted. There was some information gained from documenting the spatial association of features and based on previous tests at similar sites, there may be some potential for recovering subsurface artifacts from camp fires and buried trash pits. In consultation with BLM, the site was seen to lack integrity of setting, feeling, and association that would provide additional information to the historic context of the DTC-CAMA. Archaeologically recovered information would not add significantly to our understanding of World War II training exercises. It is therefore recommended that this site not be considered NR eligible.

V. RECOMMENDATIONS

The following significance evaluations and mitigation recommendations are based on the application of National Register eligibility criteria as set forth in the National Register Guidelines (36 CFR Part 60). These evaluations were undertaken with the explicit goal of continuing with the previous cultural resource evaluations at Gold Fields and by applying the information gained from the previous testing and data recovery programs for the Mesquite Mine and the Highway 78 realignment projects. Implementation of the recommended data recovery procedures should be formalized in an approved treatment plan that specifies historic contexts, research goals and questions, data needs, analytic techniques, report preparation, and curation.

Five types of cultural resources are discussed: 1) chipping stations and lithic scatters, 2) rock rings and alignments, 3) prehistoric trails and associated features, 4) the historic wagon road, and 5) World War II activity areas. Each site type possesses specific potential values, for which specific research approaches can best be applied. It is therefore best to examine sites of a common type as a group within a regional context, given that the proposed Mesquite Landfill project encompasses a fairly large area and future mitigation by avoidance is unlikely. The historic contexts and scientific significance of each cultural resource type have also been considered in making mitigation recommendations. Many of the sites relate to each other as a complex in which recurring activities focus on specific geographical or environmental factors. These include lithic resource availability and the natural transportation corridor between the Salton Trough and the Colorado River.

The criteria for determining National Register eligibility pursuant to the National Historic Preservation Act of 1966 (36 CFR Part 60.4) are the standard for evaluating significance. As published in the *Federal Register* (November 16, 1981, 46(220):50189) they are stated as:

The quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association and:

a. That are associated with events that have made a significant contribution to the broad patterns of our history; or

b. That are associated with the lives of persons significant in our past; or

c. That embody the distinctive characteristics or a type, period, method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d. That have yielded, or may be likely to yield, information important in prehistory or history.

The National Park Service (1982, 1985) provided further guidance for applying National Register criteria and these have also been used to evaluate this corpus of cultural resources. The significance of the prehistoric and historic sites in the project area is largely embodied in criterion "d."

Table 1 provides a complete inventory of sites in the project area with the current or recommended NR status of each given in column 6. Table 3 lists all newly inventoried sites with their recommended NR status. Also included in Table 3 are previously evaluated sites for which changes in NR status are herein recommended. These include completely excavated or treated NR eligible sites from prior impact mitigation programs, which would no longer be considered NR eligible under criterion "d."

A. Chipping Stations and Lithic Scatters

None of the nine newly recorded and 12 previously recorded lithic procurement sites are considered eligible for the National Register. The nine isolated lithic occurrences that were previously recorded as sites and the five newly recorded isolates are de facto ineligible for National Register inclusion. Those remaining lithic sites contain no diagnostic tool types, too few artifacts, and too low a diversity of materials to add new information of lithic technology, chronology, and hunter-gatherer settlement and subsistence in the project area. Three lithic sites in the project area are no longer eligible because they have already undergone data recovery (CA-IMP-4990, -4992, -4998). The remaining sites do not contain data that will add substantially to the corpus of artifacts or conclusions drawn from the previous data recovery of lithic procurement sites in adjacent areas (Schaefer 1985b, 1986; Shackley 1988b). No additional research is therefore recommended.

One chipping station (CA-IMP-6691/ML-7) and one isolated flake (CA-IMP-4977-I/ML-18) occur within the northeasternmost corner of the Singer Geoglyphs Area of Critical Environmental Concern (ACEC). Neither site is recommended for NR eligibility. This ACEC No. 67, originally identified as the Gold Basin/Rand Intaglio ACEC, was established by the Bureau of Land Management to protect several rare and unusual serpentine ground figures (BLM 1985). All of these figures occur to the south of the Mesquite Landfill project area and have been fenced to prevent accidental damage. A much larger buffer zone that includes both identified prehistoric and historic resources was included in defining the ACEC boundaries. The entire ACEC covers all of Sections 22, 27, and 34, and portions of Sections 21, 28, and 33; Township 13 South, Range 19 East. The geoglyphs will not experience any impacts from the proposed project. Although the boundaries of the Mesquite Landfill do extend into the northwestern tip of Section 21 within the ACEC, plans call for avoiding any impacts within the ACEC and site CA-IMP-6691 will thus remain unaffected. Therefore, no additional mitigative measures are recommended.

B. Rock Rings and Rock Alignment

None of the twelve rock ring and one rock alignment sites are considered eligible for NR listing. All of them have been carefully mapped and photographed during survey projects and all lack associations with tools, artifacts, or other evidence that would contribute to their interpretations. One rock ring (CA-IMP-4989) was previously examined during the Mesquite Mine data recovery project (Schaefer 1986:37) and during which numerous other rock rings with associated artifacts underwent

extensive documentation. Of the latter, only CA-IMP-4990 was within the Mesquite Landfill project area. Subsurface tests of other rock rings in adjacent areas consistently demonstrated that no subsurface deposits are associated with these features. Five rock ring sites (CA-IMP-4991, -4993, -4994, -4995, -4997) and one rock alignment (CA-IMP-5000) in the project area were previously evaluated and were either determined to be ineligible for the National Register or underwent data recovery. These six were subsequently destroyed during Mesquite Mine development. Those remaining have been adequately recorded. No additional research is recommended.

C. Trails and Associated Features

Eleven prehistoric trails and associated features have been documented in the Gold Fields project area. One of the trails, CA-IMP-5970, was previously recommended as not NR eligible and no longer exists. The prehistoric trail component of CA-IMP-4983H was determined significant during previous Gold Fields projects. The remaining nine sites (CA-IMP-1881, -1976, -1978, -1979, -4637, -4979, -5082, -6695 [ML-12], and -6696 [ML-13]) are also recommended for National Register eligibility under criterion "d." It should be noted that while ten site numbers are used here, only seven distinct cultural resources are actually represented. Sites CA-IMP-4637, -4983H, and -5082 are all part of the same trail, and sites CA-IMP-1881 and -1976 similarly represent one trail. Other previously recorded "trail markers" were determined to be modern features based on the presence of fresh caliche on upturned rock surfaces, anomalous state of preservation, or association with modern artifacts. These sites are recommended as ineligible for National Register inclusion. The authentic trail segments are a related complex of parallel and interconnected routes that Native Americans used to traverse the area between the Colorado River and Imperial Valley. Sufficient pot drops exist along these trails to determine relative dates for the three major phases of the Late Prehistoric period: Patayan I-III. One expected use period was the Patayan II (A.D. 900-1600) when the Colorado River flooded the Salton Trough to form Lake Cahuilla. Colorado River based peoples made extensive use of the fish, birds, and vegetation that flourished along the marshy edges of Lake Cahuilla. The project area may have been a natural transportation corridor through the Chocolate Mountains in both earlier and later periods, and this chronology needs to be established. The fact that rock features, lithic scatters, and pot drops were found in direct association with these trails increases their information potential. Indeed, Malcolm Rogers used the "horizontal seriation" of trail systems in the Colorado Desert to derive the first relative chronology of Buff Ware ceramics that is the basis for current ceramic typologies and regional Patayan cultural chronology (Rogers 1945; Waters 1982).

A program of data recovery through implementation of a treatment plan is recommended if avoidance of significant sites is not feasible. The trails form a complex that may represent changes in specific routes through time or a pattern of parallel or intersecting routes that were used contemporaneously. Specific correspondence of trail segments with chronological periods can be determined through several research approaches. First, the trail systems should be carefully and accurately mapped on aerial photographs and topographic maps. As part of this endeavor, the trails should be traced as far as the Imperial Sand Dunes to the west and the Chocolate Mountains to the east to determine the extent and ultimate direction of the system, and possible alignment to geographical landmarks. No artifact recovery is recommended for sites outside the project area. Breaks in the trails, patterns of overlapping routes, and associations with geomorphic surfaces should be carefully observed and recorded to establish hypothetical temporal relationships that can be tested through ceramics and varnish analyses. The Late Prehistoric period is best investigated by the detailed mapping, recovery, reconstruction, and analysis of pot drops along the trail. Ceramic analysis and typing can indicate

the location of manufacture and time period. For example, Salton Buff pots are associated with Lake Cahuilla and were tempered with the distinctive sands found along the shoreline. Tumco Buff and Parker Buff, in contrast, were more prevalent on the Colorado River at the same time. Travel before Lake Cahuilla was established would be indicated by finds of Black Mesa, Colorado Red, and Colorado Beige. Post-Lake Cahuilla travellers would have broken Colorado Buff or other contemporary types on the trail.

Recent advances in desert varnish analysis may further provide temporal controls for understanding not only the trail systems, but the entire prehistoric sequence in the Gold Fields area. Ronald Dorn at the Department of Geography, Arizona State University, and one of the principal investigators in desert varnish analysis, has recently obtained very favorable results in dating Mohave Desert lithic assemblages and also rock art (Dorn et al. 1986). The technique involves application of accelerator radiocarbon dating to the organic fraction in the microbe induced varnish on desert artifacts. This is then used to calibrate rates of chemical change in certain ions in the mineral fraction of the varnish. The ratio of change over time may therefore be used to determine the age in which a fresh flake was removed from a core, a tool was last resharpened, or a rock was freshly broken. Selected lithic samples from chipping stations associated with trails should undergo cation-ratio measurement by application of proton-induced x-ray emission (PIXE) analysis. A small sample of previously collected lithic items from previous Mesquite Mine data recovery projects should also be submitted for analysis to complement the trail data and to provide a chronological framework that could not be established in earlier studies.

Native American participation in the trail system study would also be beneficial. Considerable oral history and mythology surround the use of trails in the Colorado Desert and this trail system may be specifically remembered. Efforts should therefore be made to consult with Quechan historian, Mr. Lori Cachora, of the Ft. Yuma Reservation and with tribal elders of the Colorado River Tribes Reservation. Efforts should also be made to include tribal representatives in the field team.

D. Historic Wagon Road and Prehistoric Trail

This extensive wagon road follows the same route as one of the prehistoric trails. The historic component includes parallel wheel ruts and an assortment of historic artifacts. The prehistoric component is partially obliterated but includes several pot drops and lithics along the single trail. The previously recorded portion was documented as CA-IMP-4983H with a portion of the prehistoric component recorded as CA-IMP-4637 and -5082. Site CA-IMP-4983H was previously determined eligible for the National Register based on criterion "d" (scientific significance) because it contained useful information on prehistoric and early historic transportation. An additional southern section was recorded in the current survey as ML-14 and incorporated into CA-IMP-4983H.

As stated previously, BLM evaluated this site to be NR eligible in June 1984 during the Mesquite Mine project. BLM entered consultation with SHPO at that time and in accordance with the programmatic agreement, BLM assumed SHPO concurrence in the significance evaluation after SHPO did not respond and this was documented on September 13, 1984. It is recommended that mitigation of impacts be accomplished through implementation of a treatment plan including data recovery. The legal covenant on the land title for this property requires Gold Fields, its heirs, or assigns, to consult SHPO directly on any plans to alter, impact, or destroy the site. BLM recommends that Gold Fields

should send a letter to SHPO acknowledging the land exchange and legal covenant, and indicating that BLM will assume the lead role in the consultation by benefit of having been lead agency in the Section 106 compliance process. Data recovery will then void any need to retain the covenant.

Data recovery at the prehistoric trail component should be integrated into the treatment program for the other prehistoric trails. The historic component involves additional types of research to mitigate impacts. First, a detailed archival search should be undertaken to document the chronology and historical uses of the wagon road. Early maps, photographs, and documents should be examined at the Imperial Valley Historical Society, Bureau of Land Management, California Division of Mines, and other sources. The wagon road should then be carefully mapped and selected profiles drawn. All historic artifact scatters along the trail should be carefully mapped and collected for analysis. Most of the artifacts are expected to be items that were discarded by drivers and passengers, much like road-side littering today. Some artifacts may also have been intentionally dumped. One common class of item found along the road are tobacco tins. Glass, ceramic, and other metal items also provide clues as to the nature of early historic transport. Efforts should be made to infer the various functions of the road as both a passenger route and as a commercial route for both the local mines and early homesteads in the Palo Verde and Imperial valleys. Artifact analysis should be oriented to determine the chronology, function, and range of behaviors associated with the wagon road. Artifact dates can be used to determine the time periods of use and potentially, the intensity of use over time. Artifact types can also be associated with the gender, profession, and socio-economic class of the users. The spatial distribution of the artifacts along the route should also help to infer the patterns of early road side behavior. When integrated with historical research, these data can be used to reconstruct the history of this historic transportation route.

E. World War II Activity Areas

The complex of bivouacs, trash pits, hearths, and other facilities were part of the DTC-CAMA, founded by Major General George S. Patton, Jr. to train for the invasion of North Africa during World War II.

The desert training center operated over a two year period from 1942 through 1944. It was the largest military training installation ever to have existed (Meller 1946). The facility was first established as the Desert Training Center (DTC) by General George S. Patton. It extended from the Colorado River on the east to a point slightly west of Desert Center, California, on the west and from Searchlight, Nevada, on the north to Yuma, Arizona on the south. The center was established to train troops in desert warfare in anticipation of the North African Campaign. It was ideal in that it contained a variety of terrain types and no large population centers (Howard 1985:273-274).

Following the success of the North African campaigns an emphasis on desert warfare was no longer necessary. The name and function of the Desert Training Center was changed. It was redesignated as CAMA on October 20, 1943 and its purpose expanded to a simulated theater of operations emphasizing other large-scale logistics and not exclusively desert warfare tactics. The facility then provided maximum training of combat troops, service units, and staff under conditions similar to a combat theater of operations. The training area was enlarged to extend from Phoenix, Arizona, on the east to a point 350 miles from Pomona, California, on the west and from Yuma, Arizona, on the south, to Boulder City, Nevada, on the north (Howard 1985:281-282). The DTC-CAMA contained

eleven major camps - with seven in California and four in Arizona - and trained over a million troops in its two years of operation.

During the DTC period, exercises emphasized operating with restricted water supply, sustaining operations remote from railheads, resupplying under cover of darkness, and combined training with the Army Air Force (Howard 1985:274). A four phase training program was developed that would not exceed six weeks in duration. The first phase training emphasized the individual, squad, and platoon. The second concentrated on the company and battery. The third phase consisted of battalion training and the fourth emphasized the combat team. The training program ended with an exercise lasting several days and covering about 300 miles. Advanced supply bases were established along projected routes, tactical maneuvers were conducted in darkness, and tactical bivouacs were established in the presence of hostile air and mechanized threats (Howard 1985:278; Meller 1946:13).

The training resulted in development of tactics specifically designed for desert terrain. Methods of advance were established in which men and equipment were dispersed so that they would not present an effective target from the air. In addition a method of going into bivouac was developed through limited and controlled dispersion that provided a poor air target, good defense against ground attacks, and a means of rapidly reassuming march and combat formation. Even in open places where sparse vegetation did not exceed two and a half feet, a whole combat team of armored vehicles and trucks could be arranged so that it was practically invisible to observers in aircraft above 2,000 feet (Patton 1942).

The War Department changed the mission and name of the DTC to the CAMA on October 20, 1943 because it determined that desert warfare no longer needed to be emphasized. A broader simulated Theater of Operations approach included solving complex communications and supply problems and Army Air Force support of ground troops (Howard 1985). Training during the CAMA period consisted of a 13 week program. Firing ranges of all types were constructed and troops trained with pistols, machine guns, rifles, and artillery. They also took courses in infantry tactics using live ammunition. Emphasis was placed on development of platoon efficiency. Platoons of 40 to 45 men were sent out on six day field problems involving directional skills and coordination with supply units. The three final weeks consisted of maneuvers. The first exercise involved a defensive force establishing a position for the purpose of protecting a vital area or installation. The second exercise consisted of field maneuvers that simulated a campaign of approximately 11 days and 10 nights designed to test the endurance of units and their ability to fight and resupply over great distances while providing daily maintenance of equipment and recovery and evacuation of disabled vehicles (Chaplin 1990:24; Meller 1946:62).

Documentary sources on bivouac and field sites are extremely scarce. This was determined by Dr. Eugene Chamberlin (1990) while conducting exhaustive research for the Camp Pilot Knob, California, Registered Landmark No. 985 monument dedication. Camp Pilot Knob is the nearest major camp and probably the divisional headquarters for the operations in the Gold Fields area. He found that very few records survived from individual camps. When Chamberlin found that the George Patton Museum did not maintain extensive documentary materials on localized activities, he contacted the U.S. Military History Institute (USAMHI) at Carlisle Barracks, Pennsylvania and the Installations Records Division, Military Reference Branch of the National Archives in Washington, D.C. There he discovered that the detailed records from actual camp operations has been buried in

landfills between 1946 and 1950. One of the reasons so much material was destroyed was the relevation that the documents were written with very toxic inks. What records were kept were not really the most informative. Archivist stressed documents that concerned "who was in charge and where" and not how camps were operated (Chamberlin 1990:5, 18). Chamberlin found that the few previously restricted records to be released were too general to answer the specific questions of camp operations that he wanted answered. Despite these limitations, some documentation does exist although it does provide a rather normative view of DTC-CAMA.

At approximately 50 years of age, these sites now require consideration for potential National Register eligibility. World War II sites of less than 50 years had previously been evaluated for eligibility only if they were likely to be of "exceptional importance" and where sufficient time had passed to demonstrate their historical significance under criterion "a" (National Park Service 1982:65). Many larger encampments and small exercise areas exist throughout the Colorado, Sonoran, and Mohave deserts that are only now beginning to receive additional consideration to determine if they have historical and scientific importance for understanding the range of operations, organization, and daily lives of the participants (Meller 1946). While the large divisional camp sites reflect the activities that surrounded field commanders at their operational headquarters, their support staff, and centralized operations, do the smaller bivouac sites provide details of how the regular field infantry were trained to deal with forthcoming desert battles? To what extent are their experiences embodied in these isolated and rudimentary camp sites? Are these types of sites for which official papers and documentary sources are scarce? Can spatial patterns of tent pads, fox holes, hearths, and trash deposits be used to reconstruct the strategies employed by these men and their officers to meet the individual and collective challenge of desert combat?

None of the seven remaining World War II camps in the project area are recommended to be considered National Register eligible. Sites CA-IMP-5877H, -5905H, -6692H (ML-8) (probably part of CA-IMP-5872H), -1971H (ML-11), and -6697H (ML-15) all contain a variety of features including tent pads, rock alignments, hearths, and trash pits that reflect military camp life and tactics. They lack integrity of setting, feeling, and associations, however, that are more readily appreciated at divisional headquarter sites and larger encampments. They are also not expected to produce substantial archaeological remains that help to understand this aspect of World War II history. Two additional sites not considered significant are CA-IMP-6645H (ML-1), an isolated trash pit, and CA-IMP-4987H, a small artifact scatter. The trash pit had no associations with other features, and CA-IMP-4987H contained only two shell casings and a can lid that was previously collected.

Although this site type may be considered to lack significant research values at this time, future inventories of some of the larger and better preserved bivouac sites may well be assessed as significant under criterion "d." This is because the archaeological data base reflects the actual outcome of human behavior while historical documents, particularly in the case of DTC-CAMA, often provide normative or idiosyncratic images of the past. Needless to say, both data bases require careful interpretation and critical assessment, and the application of explicit scientific and historical research questions. Such abound for the study of WWII camps and include questions of military command structure, the degree of flexibility in the practical application of desert warfare tactics, issues of gender, social hierarchy, and social dynamics in the military, and finally reconstructing daily life at a bivouac.

F. Summary

The evaluation of 72 cultural resources (58 sites and 14 isolates) in the Gold Fields Regional Landfill Project area indicate that ten sites have sufficient scientific information potential to substantiate their eligibility for inclusion on the National Register of Historic Places. These sites include eight prehistoric trail segments with related pot drops, lithics, and cultural features (CA-IMP-1881, -1976, -1978, -1979, -4637, -4979, -6695 [ML-12], -6696 [ML-13]). Additional trail segments also occur at multicomponent sites CA-IMP-4983H and -5082. Site CA-IMP-4983H was previously determined to be a significant property eligible for National Register listing because it contains the remnants of the historic Glamis-Blythe wagon road. A data recovery program has been recommended to mitigate potential impacts related to the proposed landfill project, given that avoidance is not expected to be a feasible alternative. Other sites in the Mesquite Regional Landfill project area have either been previously assessed as not significant, no longer exist, or are herein assessed as not significant.

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MESQUITE REGIONAL LANDFILL EIS/EIR

APPENDIX E-2

CULTURAL RESOURCE INVENTORY FOR THE PROPOSED GOSSER PROPERTIES

DECEMBER 1993

VOLUME I

RESULTS OF A CLASS III CULTURAL RESOURCES INVENTORY OF THE PROPOSED GOSSER PROPERTIES/GOLD FIELDS/BLM LAND EXCHANGE

Prepared for:

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December 1993

USGS Quads: Wiley Well, West of Palo Verde Peak, Martinez Mtn., Valerie
Acreage: 2,240
Keywords: Imperial County, Riverside County, Archaeological Survey, Lithic Scatter, Rock Rings, Prehistoric Trails, Quarry, Ceramics

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I. MANAGEMENT SUMMARY

An intensive surface survey of 2,240 acres for the proposed Gosser Property/BLM land exchange resulted in the documentation of seventy-one sites and three isolates. All were found in the three sections of the Chuckwalla Basin in northeastern Imperial County. No sites were documented in the two quarter-section parcels in the Santa Rosa Mountains of Riverside County. The documented sites revealed a pattern of ephemeral hunter-gatherer resource exploitation and travel through a marginal desert environment. The sites encompass the San Dieguito through Late Prehistoric and Ethnohistoric cultural patterns. Included within the seventy-one sites were three quarries, ninety-two chipping stations, ten rock rings, two cleared circles, one boulder metate, eight trails, six pot drops, and a possible historic rock alignment. No impacts to cultural resources were projected from the transferral of these sites from private property to the public domain. Only the three quarries were considered National Register eligible. The twenty-three sites with trails or having associations with trails were given indeterminate National Register status. These site may require additional research to verify their significance. The remaining forty-five chipping stations were determined to be not eligible for National Register inclusion.

Site types were found to be associated with specific topographic and natural resources. Trails were found to link major washes or were directed toward tanks. One trail with late prehistoric pottery appears to represent a major east-west transport corridor. Quarries and chipping stations were found on alluvial terraces where cryptocrystalline silicates could be found. Rock rings and cleared circles were found near trails or lithic reduction areas.

II. BACKGROUND

A. Project Description

An intensive pedestrian survey and inventory of cultural resources was conducted from April 14-28, 1992 on 2,240 acres land owned by Ben Gosser. This survey was funded by the Gold Fields Mining Corporation, who propose to purchase the land for an exchange with the USDI, Bureau of Land Management (BLM). This land would be incorporated into adjacent BLM holdings in exchange for land to be used for the proposed Mesquite Regional Landfill adjacent to the Mesquite Mine near Glamis, Imperial County, California. Five distinct parcels located in two very distinct geographical zones were investigated (Figure 1). The eastern geographical zone is located in the Chuckwalla Bench area of northeastern Imperial County and includes sections 1, 11, and 21 of Township 9 South, Range 19 East (Figures 2 and 3). This area contains a checkerboard of public and private patented lands, eleven to fifteen miles east of Palo Verde California and twelve to fifteen miles south of Interstate Route 10. Section 1 lies directly south of the Riverside-Imperial County border, five miles south of Wiley's Well. Relatively flat alluvial surfaces in a Basin and Range geomorphic area characterizes the parcels in the eastern zone. The western zone is located in the eastern flanks of the Santa Rosa Mountains in south-central Riverside County and includes the north half of the north half of Section 7 and north half of the south half of Section 23, Township 7 South, Range 7 East. This zone is also developed as a classic checkerboard pattern of public and private land tenure and is located four to eight miles west of the Torres Martinez Indian Reservation and eight to twelve miles west of the town of Mecca, Riverside County, California. Steep-sided granitic mountain ridges overlooking the flat Coachella Valley characterize the western parcels (Figure 4).

B. Physical Environment

Two distinct ecological zones that require separate discussions are represented in the project area. Each zone differs in climate, vegetation, geology, soils, and hydrology. They are also sufficiently distant from each other to also possess distinct cultural histories. To a very great extent, the distribution of archaeological sites can be explained by their spatial associations with natural resources that were critical to hunter-gatherer survival in a marginal desert environment. These resources included water, plants and animals, and raw lithic material for manufacturing stone tools. Greater detail will be given to the larger and more environmentally diverse eastern zone where all of the cultural resources were found. Because of reasons of terrain and survey limitations, no sites were found in the mountainous western zone, and it will, therefore, receive a more limited treatment.

1. The Eastern Zone - Chuckwalla Bench Area

The eastern zone is located in what is described as the northeastern Colorado Desert, an extension of the Lower Sonoran Desert life zone (Jueger 1965; Shreve and Wiggins 1977). The area exhibits aspects of the Basin and Range topography that characterizes much of the region, but the ranges are broken and lack the northwest-to-southeast trend of the much older Paleozoic granitic formations to the north and east. Instead, the Paloverde Mountains to the east and Black Hills to the south and west are composed of Tertiary Period volcanics such as rhyolites, andesites, basalts, and tuffs (Morton 1977). These mountains form a basin that drains north into Sand Wash, which in turn flows

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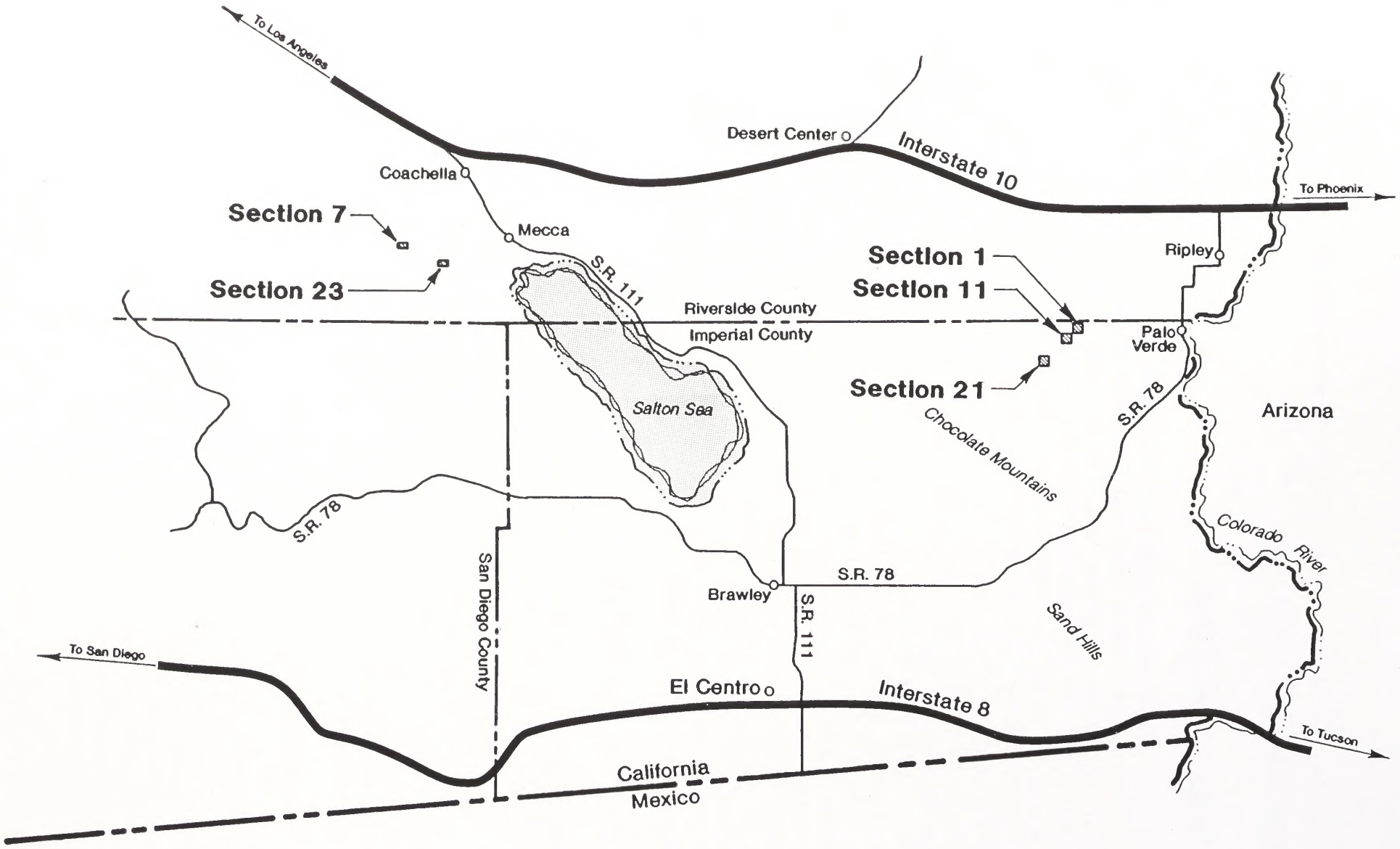


Brian F. Mooney Associates

N

0 5 10 20 miles

Regional Location Map

Figure 1

Gosser/Mesquite Land Exchange

II-2

Overview of Section 1 Looking North from South Edge of Section

Overview Section 11 Looking West from South/West Section Corner

Brian F. Mooney Associates

Figure 2

View of Section Looking West

View of South West Quarter

Section 21 Overviews

Brian F. Mooney Associates

Figure 3

View of Section 23 from the East (Section 23 is the top half of the mountain)

View of Section 7 from the east

Brian F. Mooney Associates

Santa Rosa Mts. Parcels

Figure 4

between the Little Chuckwalla and Mule Mountains to empty into Ford Dry Lake. The project area lies at the southern rim of this drainage basin at an elevation of 220-350 meters above sea level. Quaternary Period alluvial pediments form steep-sided aprons around most of the mountains. The termini of these older alluvial features are usually flat, heavily varnished and dissected desert pavements where most of the prehistoric sites are located. Holocene Period washes cut deeply through the hilly volcanic deposits and Quaternary terraces in Sections 11 and 21. These washes then drain into the flat basin and form shallow, sandy, braided stream channels that characterize most of Section 1. These unstable sandy interfluves and active washes leave little opportunity for archaeological sites to be preserved. That is why the only cultural resources in Section 1 occur on the stable quaternary terraces that border the Holocene deposits at the southwest corner of the section. Sites also tended to be restricted to similar geomorphic surfaces in the northern quarter of Section 11.

The Geode Beds in Section 21 are very well known for the chalcedony and quartz deposits (Morton 1977:40, Vargas and Vargas 1960, Weight 1947). The Potato Patch bed occur in the northeast corner of Section 21 and consist of geodes in a thin tuff bed between two rhyolite flows. The Hauser beds contain geodes in a Tertiary tuff deposits that interbed with volcanic flows and are exposed in weathered canyon and saddles on the eastem edge of Section 21. Much of the chalcedony material, as well as fine grained volcanics, has become incorporated into Quaternary desert pavements where both have been exploited by prehistoric toolmakers for thousands of years. Evidence of their activities occurs as discrete chipping stations and some larger quarry areas wherever sufficient, fine-grained materials occur on Quaternary Period desert pavements. Despite the fact that "rock hounders" have extensive exploited the project area, it was usually not difficult to distinguish remains from their prospecting activities from the prehistoric chipping stations. Authentic prehistoric lithic debitage was generally much more varnished, partially re-incorporated into the desert pavements, and contained a much larger percentage of secondary and tertiary interior flakes relative to shatter.

Access to water was a primary concern for desert oriented peoples and probably restricted their movements and settlement patterns more than any other resource. Annual precipitation is only 12.5 centimeters (5 inches) and high summer temperatures exceed 100°F from June to October. This portion of the Colorado River obtains peripheral amounts of rainfall from two season sources. Winter rains tend to be more substantial and derive from larger Pacific Ocean storms. Summer rainfall derives from the monsoonal systems to the southeast and occur as localized intense thunderstorms of short duration. Rapid run-off, percolation, and high evaporation rates result in a denuded and arid environment for most of the year. The only permanent water source is the Colorado River located up to nineteen kilometers (12 miles) to the east and more likely requiring a minimum twenty-nine to thirty-two kilometer (18-20 miles) trek along Milpitas Wash to the south and east. An alternative route of equal distance would be along Sand Wash and around the north side of the Mule Mountains.

Past environmental conditions along the Lower Colorado River have remained roughly the same since Late Pleistocene times, as indicated by pollen and macrofloral analyses of radiocarbon dated *Neotoma* midden deposits (Cole 1986). In fact, the lower elevations provided a refugium for Lower Sonoran desert scrub vegetation during the Late Pleistocene. Evidence for an extremely dry altithermal is also lacking for the Lower Colorado River. The most important environmental fluctuations for human subsistence, therefore, centered on precipitation in the Rocky Mountains and Colorado Plateau that produced the life-giving spring floods of the Colorado River. Spring flooding of the Colorado River

provided for the later prehistoric inhabitants to practice direct floodplain agriculture. Floods usually began in April and May and peaked between May and July, sometimes extending into late fall. The size and intensity of floods varied considerably, and when they failed, the Colorado River tribes would intensify their use of wild desert foods. Apparently, much of the lower Colorado River, before damming, was open alluvial terraces punctuated by alkali depressions and rapidly silted up lagoons. Periodic heavy floods and rapid evaporation precluded the development of marsh environments. Well-defined seepages in washes leading into the river valley, however, often supported stable stands of tules, sedges, cattails, and willows. The lack of marsh habitat also limited the number of breeding waterfowl (Grinnel 1914:72-73).

Localized desert water sources included springs and tanks. Clapp Spring in located in the Palo Verde Mountains, approximately 6.5 kilometers (ten miles) east of Section 1. This was formerly known as Red Butte Spring around 1917 (Brown 1920). Some temporary shallow wells may have also been dug in Sand Wash that drains the basin into Ford Dry Lake. The only other temporary water was obtained from tanks or *tinajas* that form in the bottom of washes that cut through bedrock in the mountains. Erosion produces small to moderate sized basins in which water can accumulate after each rainfall. These tanks provided not only a scare water source but also attracted large and small game animals. A series of such tanks, one still containing water at the time of the survey, was recorded in the larger wash that runs through the center of Section 21. Another named feature is Tadpole Tank, located just off Milpitas Wash Road and located just one mile southeast of Section 1. For both tanks, prehistoric trails were recorded as converging on these water sources. Although some pot drops, chipping stations, and lithic scatters appear to be associated with these trails, the general low diversity and small size of sites throughout the project area suggests that these water sources were inadequate for supporting anything greater than a short-term temporary camp or resource specific collection locality. The tanks also may have served as targets for short-term hunting expeditions.

The project area contains only limited amounts of the important desert plants that would have attracted prehistoric collectors. A creosote scrub vegetative community occupies most of the area, dominated by creosote bush (*Larrea divericata*), white bursage (*Franseria dumosa*), and brittlebush (*Encelia farinosa*). More widely dispersed species include ocotillo (*Fouqueria splendens*), jumping cholla (*Opuntia bigelovii*), and hedgehog cactus (*Echinocereus giganteus*). The area had experienced much greater rainfall than normal for several weeks prior to the survey and abundant annuals and ephemeral plant species were observed. Normally brown mountain slopes and terraces were carpeted with green. Some of these species may have provided edible greens and seeds, but only for a short time and in limited quantities. Most of the more important plant species for the native population were observed in the larger washes that supported a desert riparian plant community. The most abundant stands were in the large wash that runs from south to north through the center of Section 1, in the southeast quadrant of Section 21. Important species included honey mesquite (*Prosopis juliflora*), paloverde (*Cercidium floridum*), ironwood (*Olneya tesota*), and desert thom or wolfberry (*Lycium* sp.). The Colorado River Yumans were known to go on expeditions to the desert interiors to exploit most of these species (Castetter and Bell 1951:204). No evidence of human activities, however, were found adjacent to these riparian stands. Any artifacts would have been washed away, and in any event, it is likely that the processing took place at more optimal locations.

The project area was observed to contain abundant animals life that are known Yuman food sources. These included desert tortoise (*Gopherus agassizi*), jack rabbit (*Lepus californicus*), cottontail rabbit (*Sylvilagus audubonii*), mule deer (*Odocoileus hemionus*), and numerous lizards. Also observed was a sidewinder rattlesnake (*Crotalus cerastes*), and a nesting red-tailed hawk (*Buteo jamaicensis*). The tanks in Section 21 would have been particularly attractive to ancient hunters. Although historic river Yumans were not known as avid hunters, they would ambush large game on mountain trails that the animals used to reach tanks and springs (Castetter and Bell 1951:214-216).

A detailed discussion of past and present environments can be found in Thompson (1984), Schaefer (1984), and Swarthout and Drover (1981), with an extended discussion of Colorado River Tribes cultural ecology in Pendleton (1984). Other general sources on the environment include McCarty (1981), von Werlhof (1982:3-15), and McGuire (1982a:13-56).

C. Cultural History

The sequence of archaeologically and ethnohistorically identified cultures in the project area is generally recognized by the anthropological community, although specific interpretation of chronology and cultural patterns differs among researchers. A range of approaches to the culture history may be found in the writings of Rogers (1966), Crabtree (1981), von Werlhof (1982), McGuire (1982b), and Pendleton (1984). The reader is directed to these sources for a detailed discussion of cultural sequence and for some specific questions concerning cultural definitions and change through time. Although differing in terminology and time ranges, they all basically follow the sequence of cultural patterns outlined below.

Seven cultural patterns may be defined for the project area, extending back in time over a period of at least twelve thousand years. They are: 1) Malpais (Early Man), 2) San Dieguito, 3) Archaic 4) Patayan (Prehistoric Yuman), 5) Ethnohistoric Yuman, 6) Ethnohistoric Cahuilla, and 7) Historic Euro-American.

1. Malpais (Early Man) Pattern

The Malpais pattern is represented by a complex of archaeological material hypothesized to date from 12,000 to 50,000 years B.P. (Begole 1973, 1976; Davis, Brown, and Nichols 1980; Hayden 1976; von Werlhof et. al. 1977). The term was originally used by Malcolm Rogers (1939, 1966) for ancient looking cleared circles, tools, and rock alignments that he later classified as San Dieguito I. The term continued to be applied to heavily varnished choppers and scrapers found on desert pavements on the Colorado, Mojave, and Sonoran deserts that were thought to pre-date the San Dieguito Culture and Paleo-Indian tradition of projectile point makers. Although few would refute that most of the artifacts are culturally derived, dating methods remain extremely subjective and have been assailed on numerous grounds (Taylor and Payen 1979, McGuire 1982b:160-164). Arguments for early Man in the Colorado Desert are further weakened by the redating of the "Yuha Man". Originally thought to date over 20,000 year B.P. from radiocarbon analysis of caliche deposits, more reliable dates based on accelerated radiocarbon analysis of actual bone fragments now place the burial at less than 4,000 year B.P. (Stafford et al. 1984). Recent recalibrations of all coastal burials originally given very old dates by aspartic acid racimization further erodes the Early Man argument. None of these burials now date to more than 8,000 years B.P. (Bada 1985).

2. San Dieguito Pattern

Many of the aceramic lithic assemblages, rock features, and cleared circles in the project area have been assigned to the San Dieguito Complex (Rogers 1966). Indeed, most of the sites in the entire Colorado Desert are assumed to be San Dieguito, dating between 7,000 and 12,000 years B.P. Malcolm Rogers first defined the San Dieguito complex based on surface surveys in the Colorado and Sonoran Deserts, but later refined his constructs with excavated material from the C.W. Harris site, a few kilometers from the Pacific Coast up the San Dieguito River (Rogers 1929, 1938, 1939, 1966). Rogers saw phases of the San Dieguito Complex in the Central Aspect, that is the area of the Colorado and Mojave deserts, and the western Great Basin. Each phase is characterized by the accretion of new, more sophisticated tool types in the already existing tool kit.

San Dieguito Complex lithic technology is based on primary and secondary percussion flaking of cores and flakes. San Dieguito I and II phase tools include bifacial and unifacially reduced choppers and chopping tools, concave-edged scrapers (spokeshaves), bilateral-notched pebbles, and scraper planes. Appearing in the San Dieguito II phase are finely-made blades, smaller bifacial points, and a larger variety of scraper and chopper types. The San Dieguito III phase tool kit is appreciably more diverse with the introduction of fine pressure flaking. Tools include pressure-flaked blades, leaf-shaped projectile points, scraper planes, plano-convex scrapers, crescentics (amulets) and elongated bifacial knives (Rogers 1939, 1958, 1966; Warren and True 1961; Warren 1967). Various attempts have also been made to serrate cleared circles into phases but no convincing chronological scheme has yet been developed.

Because of the surface nature of desert sites and the lack of chronological indicators, no one has yet substantiated the validity of Rogers' phase designations as chronologically successive changes in the tool kit of a long-lived culture. Subsequent excavations at Rogers' C.W. Harris site also failed to confirm his original observation of a stratigraphic separation of Phase II and Phase III assemblages (Warren 1967:171-172). Indeed, all phase distinctions may likely be due to economic specialization at specific site loci, or even due to sampling error whereby later phase diagnostic artifact types are not represented in a specific archaeological collection. Rogers (1966:39) also identified different settlement patterns for each phase but as Vaughan (1982:6-11) has argued, these distinctions are poorly defined and inconsistently applied.

Therefore, no phase distinctions will be made for the San Dieguito in future discussions. It will be considered, rather, as a single archaeological and cultural entity with considerable time depth. Any consideration of inter-assemblage variability will be the subject of empirical study, but no defacto assumptions of temporal phases will, or should, be made here.

The San Dieguito Culture, as defined by the known complex and site associations, is a hunter-gatherer adaptation based on small mobile bands exploiting small and large game and collecting seasonally available wild plants. The absence of ground stone from the complex has been seen as reflecting a lack of hard nuts and seeds in the diet, as well as a cultural marker separating the San Dieguito Culture from the later Desert Archaic Culture (Rogers 1966; Warren 1967; Moratto 1984). Portable manos and metates are increasingly recognized at coastal sites, radiocarbon dated in excess of 8,000 B.P., and in association with late San Dieguito complex assemblages (Kaldenberg 1976; Bull 1984). In regard to the Colorado Desert, Pendleton (1984:68-74) notes that most ethnographically

documented pounding equipment for processing hard seeds, wild mesquite, and screw beans was made out of wood and does not preserve well in the archaeological record.

Settlement patterns also indicate some basic elements of the San Dieguito Culture. Sites are characteristically located on flat areas but the largest aggregations occur on mesas and terraces overlooking larger washes. Where lakes were present, sites are located around the edges. These are areas where a variety of plant and animal resources could be located and where water would at least be seasonally available. It may be assumed that at the beginning of the Holocene period, these areas were somewhat more suitable for habitation, although the climatic evidence reviewed above suggest that the early San Dieguito inhabitants had already adapted to arid conditions.

Pendleton (1984) has made a strong case, based on ethnographic analogy from Colorado River tribes, that the San Dieguito occupation in the eastern Colorado Desert was focused on the river floodplain. She tested her model with the large array of sites and data sets in the Picacho Basin. Surrounding desert areas were used only to a limited degree for special resource exploitation within a foraging radius of logistically organized collecting groups.

3. Archaic Pattern

The Pinto Complex, dating between 7,000 and 4,000 B.P., and the Amargosa Complex, dating between 4,000 and 1,000 B.P., were regional manifestations of the Desert Archaic Culture that enveloped the Great Basin and California Deserts (Warren 1984). They represent regional specializations of a diversified hunting and gathering tradition. Most of the tool types are similar to the San Dieguito, but there are the added notched and large-stemmed projectile points and the more frequently occurring manos and metates, that identify these later sites and indicate the added importance of seeds and nuts. These complexes are not well represented in the Colorado Desert. There may just be too few diagnostics with which to distinguish these sites from earlier and later patterns. In any case, it appears that the Desert Archaic Culture provided the technological basis and subsistence practices that later developed into the Patayan Pattern.

4. Patayan Pattern

The Patayan cultural pattern is marked by the introduction of pottery on the lower Colorado River approximately 1,200 years ago. A pre-ceramic phase can also be discerned by the introduction of new Desert Side-notched and Cottonwood type projectile points to the Amargosa Complex at about 1,500 years B.P., but this transitional phase is rather difficult to identify in the desert (Moriarty 1966). Techniques of flood plain agriculture were also introduced to the Patayan at the same time as pottery. Burial practices also changed from extended inhumations to cremations in ceramic vessels. All of these new traits are typical of the Hohokam Culture, and it is quite probable that these traits reached the Colorado River from southern Arizona via the inhabitants of the Gila River. From the Colorado River the cultural complex spread west to the Pacific Coast. Agriculture may not have been adopted beyond the eastern Peninsular Range until very late Prehistoric times or after European contact.

The Patayan Culture is typified by small mobile groups living in dispersed seasonal settlements along the Colorado River floodplain. They erected rock-outlined jacal structures, semi-subterranean earth

houses, simple ramadas, or brush huts, depending on the season and function of the settlement. Long range travel to special resource collecting zones, trading expeditions, and possibly some warfare are reflected by the numerous trail systems throughout the Colorado Desert; trail systems are associated with accumulated ceramic "pot-drops", trail-side shrines, and other evidence of transitory activities. Many of the pictographs, petroglyphs, and bedrock grinding surfaces in the Colorado Desert have also been associated with the Patayan Pattern, although direct dating and cultural affiliation of such features is difficult to determine.

Three phases of the Patayan pattern can be identified in addition to the pre-ceramic phase. These are based on changes in pottery types and most importantly on the cultural and demographic effects of the infilling and subsequent desiccation of Lake Cahuilla. The Patayan I phase began about 1,200 years ago with the introduction of pottery. It appears to be confined to the Colorado River and the artifact complex in this phase bears the closest similarity to the Hohokam (Waters 1982a). The Patayan II phase began 950 years ago and is contemporary with the infilling of Lake Cahuilla. Pottery producing people spread out from the Colorado River to periodically inhabit both the east and west shores of the new lacustrine habitat. New ceramic types appear at this time reflecting localized manufacture at Lake Cahuilla and technological changes in the Colorado River area. The final Phase III began with the final recession of Lake Cahuilla approximately 500 years ago. The phase continued into the ethnohistoric period, ending in the late nineteenth century when Euro-American incursions disrupted the traditional culture. During the last phase, a new pottery type, Colorado Buff, became the predominant ceramic in the Colorado Desert and along the Colorado River, according to Waters (1982b). Ceramic data recovery for the Picacho Basin project failed to identify any Colorado Buff Ware. Assuming that an adequate sample was collected, Townsend (1984) concluded that this ware is not common to the river area but rather that it is a western Lake Cahuilla regional type with one focus in the San Sebastian marsh area. A history of research on the Patayan, and a synthesis of arguments concerning cultural affinities and geographical distributions, can be found in Schaefer (1984), McGuire (1982b), and Swarthout and Drover (1981).

5. Ethnohistoric Yuman Pattern

The ethnohistoric descendants of the Patayan are identified linguistically as the Colorado River Yumans (Trippel 1889; Forde 1931). When first contacted by Euro-American cultures, they were practicing virtually the same economic patterns, with the same material culture, that have been traced back at least 1,000 years on the Colorado River (Stewart 1983a:1). It is not known to date which linguistic sub-branch was represented in prehistoric times. If historic geo-political patterns of warfare and population displacement are applicable to the prehistoric period, then there may have been considerable movement of territorial boundaries between groups or even complete population displacement. Warfare and raiding were integral elements of the traditional value systems but periods of naturally occurring drought and flood failure also appear to be a major cause of widespread conflict (White:1974). Nevertheless, all of the Colorado River Yuman groups shared many of the same economic and technological patterns, social organization, and cultural values, and would, therefore, have left virtually identical archaeological remains (Jorgensen 1983).

For an indefinite time before 1827-1829 the project area lay on the boundary between the Quechan to the south and the Halchidhoma to the north. The Halchidhoma were first identified by Juan de Oñate in 1604-1605 as being south of the Quechan and north of the Cocopah, south of present Yuma. Subsequent accounts, including Kino in 1699, verified this location in the Colorado River delta. By

1705, Kino found the Halchidhoma had moved north to the area north of Quechan territory. This was later confirmed by Garces' 1775 account. In this location they came into direct conflict with the Mojave who had been recorded by the Oñate expedition in 1604 to be in the Parker area, but who were obviously displaced from this territory. Dobyns, Ezell and Ezell (1963) document how conflicts caused by Spanish, Mexican, and early American incursions into the Colorado River exacerbated the hostility between the Halchidhoma and the Mohave-Quechan alliance. A powerful alliance between Quechan and Mojave started to drive the Halchidhoma out of the project area between 1827 and 1829 and soon after, the last Halchidhoma had followed other Yuman groups -- the Halyikwamai, Kahwan, and Kavelchedom -- who had been displaced by the Quechan and Mojave expansions. After 1826 three families moved to Magdalena, Sonora. The whole tribe followed, but after epidemics that occurred between 1833 and 1838 the survivors moved in with the closely related Maricopa on the Middle Gila River, who had left the lower Colorado River before 1700 for the same reasons (Steward 1983a:1-3; Harwell and Kelly 1983:74; Dobyns, Ezell and Ezell 1963).

The much stronger and more numerous Mojave took over full control of the region following the final move of the Halchidhoma, having extended their original territorial base from the Mojave Valley region near Nevada to the area around Blythe. Today the Mojave remain an important branch of the four main tribes now resident on the Colorado River Indian Reservation, established in 1865, north of the study area and adjoining Parker (Stewart 1983b:55).

6. Ethnohistoric Cahuilla Pattern

The following discussion is taken partly from the summary of the Toro Canyon area by Lowell Bean (1990). The western project area in the Santa Rosa Mountains and its immediate environs has been owned, occupied and used by Cahuilla Indian people for centuries, possibly as early as A.D. 1000. The Cahuilla peoples are a Takic speaking group of people, who occupied, in total, an area generally within what is now Imperial, Riverside, and San Diego counties. Although linguistically unrelated to the Yumans, they came to share many of the same subsistence practices, rituals, and mythical themes.

At the center of this area is the Santa Rosa Mountains. Some dozen or more independent political groups-clans owned this territory. Each of these clans was an independent, politically autonomous land holding unit (Bean, 1972). Each of their land holdings ranged from desert or valley floor to mountain areas within which several biotic zones existed. They comprised several lineages, each of which had an independent community area which it owned within the larger area of the clan.

In addition to residence areas of each lineage, and areas within a clan territory which it owned in common with other clan members, each lineage had ownership rights to various food collecting, hunting, and other areas. Individuals also owned specific areas or resources, e.g., plant foods hunting areas, mineral collecting places, or sacred spots used only by shamans, healers and the like. These clans varied in size or population from 1,000 to several thousand people. They were arranged so that each lineage or community was placed in an area which was near significant water and food resources. Within each of these areas, generally some miles from another, a community spread itself widely. Houses and other structures were spatially at some distance from one another. Often a community would spread over a mile or two in distance. Each nuclear and extended family had houses and attached structures for the storage of food, shaded work places and the like. In each community there was a house of the lineage or clan leader.

Close to each community were sources of many food resources, building materials, minerals, and medicines. Usually an area within one to three miles contained the bulk of materials needed for daily subsistence--although territories of a given clan might be larger, and longer distances were travelled to get precious or necessary resources, usually at higher altitudes. While most day-to-day secular and religious activities took place within the community, there were places, at some distance from the community, where people would necessarily stay for extended periods of time, e.g., acorn or pinon groves. Throughout the area there were sacred places used primarily for rituals, intergroup meetings, caches for sacred materials, and shamanically important spots. Generally in hilly, rocky areas, cave sites or walled cave sites were used for temporary camping, storage of foods, fasting sites for shamans, hunting blinds, and the like.

The steep slopes that make up the Gosser properties in the Santa Rosa Mountains offered few opportunities for subsistence activities. Adjacent areas west of Section 7, however, contained earth ovens and artifacts that indicate the Cahuilla collected and processed agave and cactus on these slopes. A small palm oasis with cottonwood, and sycamores was located at 1,200 feet above sea level, on the eastern edge of the Section 7 parcel. This area could also have been a resource collection destination.

The project area lies between the ethnohistorically documented villages of Toro and Martinez. Substantial large Late Prehistoric Period and Ethnohistoric Period temporary camps and residential bases dot the flat alluvial terraces at the base of the mountains. These sites tend to occur near springs and large washes, along the relic Lake Cahuilla shoreline, and at springs, walk-in wells, and mesquite dunes on the ancient lake bed of Lake Cahuilla (after it receded for the last time).

The Toro Canyon area was a major occupation area for the Cahuilla people in historic and prehistoric times. Today it remains an area about which Cahuillas are concerned for cultural and historical reasons. The area contains the major late 19th century village site, *mauulmii* (Place of the Palm Tree), evidence of deep water wells, the development of agriculture at an early time, an historic cemetery (still used), and various hunting, collecting and sacred areas. Nearby Toro Canyon are fish traps build along the shores of Lake Cahuilla and associated archaeological sites, including several village sites and, presently, biotic resources of traditional uses.

Gifford (1918), Merriam (field notes, date unknown), and Strong (1929:52) agreed that the *wakaikiktum* clan lived here. Gifford said that this clan originally lived near Warner's ranch, but was not Cupeño. Their location was probably in the Los Coyotes Canyon area (1918:190). Strong said the *wakaikiktum* originally lived at *tciuk* back in the Santa Rosa mountains, then at *panuksi* at the head of a canyon about seven miles south of Indio, and later come to *mauulmii* (1929:52).

According to Strong, the *wakaikiktum* (night heron) and the *panakauissiktum* (water fox) clans lived at *mauulmii* in about the 1870's. The former occupied ten houses, three of them communal, and the latter six houses. They shared the well (actually there were at least three wells here), which was probably dug by the *panakauissiktum* as earliest residents. There were two ceremonial houses, and each clan had its own area, where plants were cultivated, and its own gathering area, presumably throughout the canyon. Apparently the *sewahilem* (mesquite that is not sweet) lineage also moved to *mauulmii* from near La Mesa about 1895 (1929:52). Gifford also said the *temalanitcem* lineage, Wildcat moiety, lived at Toro Canyon (1918:190).

Martinez Canyon was the home of the *wantcinakiktum* lineage of the Wildcat moiety prior to European contact (Bean, Vane, and Young 1991). Their village was *puichekiva*, "roadrunner house", near present-day Martinez. That village later broke up and the people moved to *isilsiveyyaiutcem*, an unknown location in Martinez Canyon. Strong (1929:41-49) felt this was the original home of the lineage before they moved to the desert. They joined the *awilem* lineage when they moved to the desert, but each group maintained its own food gathering territories for spring and early summer cactus gathering in the uplands. George Wharton James (1906:239-240) was able to obtain valuable oral histories on how the Martinez Village people were forced to higher elevation during an infilling of Lake Cahuilla but returned to fish along the shores. A period of denuded habitats followed the final recession, but soon grasses and mesquite became established in the lowlands and the population prospered.

The Santa Rosa Mountain portion of the project area represents part of the traditional food gathering territories of the Toro and Martinez lineages. These parcels would have directly overlooked the Lake Cahuilla shoreline that would have reached almost to the foot of these particular ridges. Successive infillings and recessions of Lake Cahuilla would have affected the scheduling of the limited set of activities that might involved these steep slopes. For example, intensification of agave exploitation appears to correlate with the final recession as the Cahuilla shifted their seasonal rounds away from the lacustrine environment and towards other desert habitats. The ethnohistoric record indicates shifting lineage control of territories. The rate of change probably increased after the demographic and socio-political effects of Euro-american contact began to be felt. It may be assumed, however, that this pattern of change existed in a less extreme form in the prehistoric past.

7. Euro-American Pattern

The project area remained peripheral to historic events and activities throughout the historic period. H.S. Washburn, of the U.S. Government Land Office, described a wagon road in 1856 as running through Section 11, parallel or coinciding with the recent jeep trail. This route has been recorded as CA-IMP-3243-H by the Imperial Valley College Museum. Anglo population began to increase after gold was discovered at La Paz, Arizona in 1862. Five miles to the north of the project area, William Bradshaw established the Bradshaw Trail to connect the mining town of Ehrenberg on the Arizona side of the Colorado River with supplies via the Coachella Valley and western Riverside County. It remained as an important transport route for freight and passengers until the Southern Pacific Railroad arrived in 1876. It remained in use as a stage route by various companies until the 1880's and continued to provide access to the area for miners who were prospecting the Orocopia, Chuckwalla, and Mule Mountains through the early 1900s (Johnston 1976). A.P. Wiley, postmaster and merchant of Palo Verde, dug Wiley's Well in 1908 as a watering spot in Sand Wash for travellers and prospectors. The well was used to water cattle that were seasonally run through the area when feed was available (Weight 1947:26). It is likely that this historic route followed a major east-west prehistoric trail system: the Maricopa-Cahuilla trail. This system began at the ceremonial ground figure complex at Ripley and was the principal means of communication between the Cahuilla of the Coachella Valley and their Halchidhoma allies on the Colorado River. This route was the southern equivalent of the famous Cocomaricopa trail that began at another ceremonial complex located twelve miles north of Blythe (Johnston 1976:88-89).

Prospecting was probably the major historical activity in the project area, but no mineral strikes were ever developed in any of the surveyed parcels. The most significant activity surrounds the Hauser and Potato Patch beds of the Black Hills region in Section 21. First discovered by Joel F. Hauser in 1937, the deposits were brought to public attention in the 1940s when U.S. military roads opened the area to automobile travel. Amateur "rock hounders" have since continued to visit the area (Morton 1977:40, Weight 1947, Vargas and Vargas 1960, Strong 1971, Mitchell 1986).

III. METHODS

A. Previous Research

A records search was conducted by the Archaeological Information Center at the Imperial College Museum in El Centro for the project areas located within Imperial County. The Archeological Information Center at the University of California, Riverside provided resource information for the two parcels located in Riverside County. The records searches included a review of site records, maps, and manuscripts that might pertain to the project areas. Other available heritage resource listings including the National Register of Historic Places and the State Inventory were examined.

The record search indicated that the project areas had not been previously surveyed and no recorded sites were located within their boundaries. No prehistoric sites have been recorded in the immediate vicinity of Sections 1, 11, and 21 (T9S R19E). One segment of a historical wagon road (IMP-3242/3243) was recorded in the southwest corner of Section 1.

A number of prehistoric sites have been recorded at the base of the Santa Rosa Mountains, several miles east of where the two project areas are located. These sites include numerous camp sites, trails, pot drops, lithic scatters, and other types sites associated with the shoreline of ancient Lake Cahuilla. The Coachella Fish Traps National Register District is located within several miles of both study areas, as well as the Martinez Historical National Register District, four miles to the east. The project area is in the general vicinity of the Torres Martinez Indian Reservation. Four sites associated with agave food processing were recorded by BLM personnel in a sample survey area west of Section 7.

The records search indicates no previous archaeological studies have been conducted in the immediate project area. Several other studies, however, provide some context with which to interpret the documented sites of the Chuckwalla Basin within a regional context. A survey of the Wiley Well Road-Interstate Route 10 Interchange area, revealed several Late Prehistoric temporary camps associated with mesquite dunes in Palen Dry Lake (Shackley and Serr 1990). It is predicted that other such sites border the Sand Wash area that extends south to the project area. A large chalcedony quarry was documented at Pebble Terrace, over looking the Palo Verde area on the east side of the Mule Mountains (Schaefer 1985). On the Arizona side of the Colorado River a series of quarries and a cached olla were found in the Trigo Mountains that border the Colorado River (Schaefer and Elling 1987; Shelley and Altschul 1989). This study demonstrated some of the uses that inland areas were put to by river based peoples. Other relevant studies include examinations of trail systems that extend west from the Colorado river (Schaefer 1985b; Johnston and Johnston 1957).

B. Field Methods

The field survey entailed a pedestrian examination in April 1992 by Brian F. Mooney Associates (BFMA) archaeologists of three full sections and two partial sections of land. The Imperial County sections were surveyed over a two week period with a four person crew, which included Jerry Schaefer, Drew Pallette, David Ferraro, Jim Toenjes, Julie Toenjes, and Collin O'Neill. Transects were spaced at twenty meter intervals to adequately cover each study area. A measured pace and count of meters was kept to help determine location. A compass was used with triangulation to help

insure correct location. Biodegradable toilet paper was used to mark the edge of each transect as the crew traversed the study area. On the return trip, the line was followed insuring that full coverage of an area was maintained. This procedure assured excellent coverage in the relatively featureless terrain. Surface visibility was good throughout the entire project area.

All sites and isolates were recorded as they were found. Each site was plotted on a USGS topographic map and recorded on field site forms based on guidelines provided by the California Department of Parks and Recreation. At larger sites each artifact or cluster was marked using pin-flags to identify both resources and site boundaries. Site information was then recorded and mapped. A site sketch map was also drawn and appropriate photo documentation completed. Completed archaeological site records appear in Volume II of this report.

Archaeological site criteria follow guidelines defined by the Bureau of Land Management and the Office of Historic Preservation: a site is the location of associated artifacts or a feature, regardless of temporal placement or complexity. Minimally, a site must meet two criteria: 1) It must consist of at least three associated artifacts or a single feature, and 2) a site must be at least forty-five years old. The age of a site may be determined by artifactual evidence, documentary evidence, or similarity of the site to others that have been firmly dated. A minimum of at least a fifty meter area with no artifacts was used to separate artifact clusters into distinct sites. Clusters closer than fifty meters were defined as loci of one site.

IV. SURVEY RESULTS

Section A of this chapter presents a site by site inventory of the Gosser Imperial County properties of Sections 1, 11 and 21 (T 9S R19E) (Figures 5 through 7). No sites were found in the properties located in the Santa Rosa Mountains (Figures 8 and 9). All sites were recorded during the current survey and site records are provided in Volume II of this report. While temporary site numbers (GM-1-71) are used in the text descriptions, permanent state trinomial designations have been assigned to each resource, and these are listed in Table 1.

A total of seventy-one sites and three isolates were recorded in the project areas (Table 1). Contained within these sites were ninety-two chipping stations, ten rock rings, eight trails, six pot drops, three quarries, two cleared circles, a milling feature, and a possible historic wall enclosure.

Table 1 provides a summary of the site types and their recommended National Register eligibility status. Each type is described briefly below. The reader is referred to the site records for more specific details. A discussion of how these sites and assemblages fit into the prehistoric subsistence and settlement patterns of the area follows in Section B of this Chapter.

A. SITE TYPES

1. Chipping Stations and Quarries

These were by far the most common of site types encountered during the current study. The vast majority were located on well developed desert pavement areas where nodules of chalcedony and rhyolite occur. The Tertiary Period volcanic materials found in the surrounding Mule, Palo Verde, and Black Hills mountain ranges provide ample source material for prehistoric use. Most of the sites showed evidence of test knapping of various chalcedony and rhyolite nodules found on the older fans and or at exposed veins. Sites often consisted of one or two chipping stations in a limited area and contained a predominance of secondary and angular debris in the lithic assemblage. This pattern suggests the reduction of cores and the subsequential removal of useable material. The lithic assemblage found throughout the study area is typical of similar sites found in southeast California desert pavement areas. Studies by Shackley (1989, 1988) and Schaefer(1986) in the Gold Fields area, Schaefer (1985a) in the Mule Mountains, and others have demonstrated that these interior mountain ranges, which flank the west side of the Colorado River, provided an important area of lithic procurement for prehistoric peoples.

It should be noted that a number of the archaeological sites have been severely impacted by gem hunters over the last sixty years. The entire area was strewn with broken rocks and nodules that littered the landscape. Identification of prehistoric sites became problematic, at times, due to the large amount of debris left from this recent activity. The criteria used for distinguishing prehistoric sites were the types of flakes present, the amount of patination exhibited on the material, and the degree of embeddedness in the pavement. Modern debris generally had little or no patina and consisted primarily of angular debris without evidence of platform preparation or bulb scars.

TABLE 1
GOSSER/MESQUITE LAND EXCHANGE
ARCHAEOLOGICAL SITES

IMP TRI #	Temp #	Site Type	Artifacts	Area M²	NR Status	Comments
		T 9S R 19E Section 1				
-6735	GM-1	chipping station and possible cleared circle	20 rhyolite and 11 chalcedony flakes	30.25	NE	May be associated with GM-3
-6736	GM-2	chipping station	8 rhyolite flakes and 2 biface fragments	3	NE	
-6737	GM-3	trail	none	42	I	GM-1 and GM-2 may be associated. Runs east-west.
-6738	GM-4	rock ring and cleared circles	none	5,000	NE	
-6739	GM-5	rock ring and chipping station	34 rhyolite flakes	13.75	NE	Chipping station is in the center of the ring.
-6740	GM-6	trail	none	42	I	Trail goes over a pass towards Tadpole Tank.
-6741	GM-7	2 chipping stations	145 rhyolite flakes	2	I	Near a trail that leads to Tadpole Tank.
-6742	GM-8	rock ring	several rhyolite "mega-flakes"	2	NE	
-6743	GM-9	trail	none	194	NE	
-6744	GM-10	cleared circle and rock alignment	none	24	NE	
-6806	I-1	WWII oil can	Oil can + 2 lids	2	NE	
		T 9S R 19E Section 21				
-6745	GM-11	chipping station	20 rhyolite and chalcedony flakes	119	NE	Near trail GM-12.
-6746	GM-12	trail	none	30	I	
-6747	GM-13	chipping station	12 brown rhyolite flakes	2	NE	
-6748	GM-14	chipping station	12 red rhyolite flakes + 1 core	2	NE	
-6749	GM-15	chipping station	44 red rhyolite flakes + 1 multidirectional core	2	NE	
-6750	GM-16	trail and chipping station	red/brown rhyolite flakes	423	I	N/S trail that traverses the entire section.
-6751	GM-17	chipping station	24 red rhyolite flakes + 3 core fragments	1	NE	

TABLE 1
GOSSER/MESQUITE LAND EXCHANGE
ARCHAEOLOGICAL SITES

IMP TRI #	Temp #	Site Type	Artifacts	Area M²	NR Status	Comments
-6752	GM-18	chipping station	1 rhyolite flake + 1 core 6 chalcedony flakes	6	NE	May be a part of GM-19.
-6753	GM-19	quarry	8 chipping stations of rhyolite and chalcedony, low density lithic scatter, cores, core fragments	20,000	E	Large quarry area.
-6754	GM-20	trail	none	342	I	Extends NW from the tank area.
-6755	GM-21	chipping station	8 white chalcedony flakes	1	NE	
-6756	GM-22	chipping station	white chalcedony flakes	1	NE	
-6757	GM-23	chipping station	5 rhyolite flakes	1	NE	
-6758	GM-24	chipping station	28 red rhyolite flakes + 1 multidirectional core	6	NE	
-6759	GM-25	chipping station with isolates	9 chalcedony flakes + 2 cores	1	NE	
-6760	GM-26	chipping station	10 white chalcedony flakes	1	NE	
-6761	GM-27	trail and chipping station	40 white chalcedony flakes	292	I	Extends SW from the tank area.
-6762	GM-28	4 chipping stations low density lithic scatter 1 rock ring	Sta A: 21 white chalcedony flakes + 1 core; Sta B: rhyolite hammer stone + 2 flakes, 33 white chalcedony flakes; Sta C: 16 flakes + 1 biface core; Sta D: 11 red chalcedony flakes + 3 multiangular cores	4,920	I	
-6763	GM-29	quarry with 9 chipping stations	flakes, cores and associated debitage	10,400	E	
-6764	GM-30	chipping station	8 red rhyolite flakes + 1 core fragment	0.25	NE	
-6765	GM-31	4 chipping stations	Sta A: 8 red rhyolite flakes + 1 core; Sta B: 7 brown chalcedony flakes; Sta C: 10 flakes, 1 core, 1 stage 3 biface; Sta D: 5 white chalcedony flakes + 1 nodule	1,000	I	

TABLE 1
GOSSER/MESQUITE LAND EXCHANGE
ARCHAEOLOGICAL SITES

IMP TRI #	Temp #	Site Type	Artifacts	Area M²	NR Status	Comments
-6766	GM-32	2 chipping stations	Sta A: 8 white chalcedony flakes + 2 core fragments; Sta B: 8 white chalcedony flakes	7	NE	
-6767	GM-33	chipping station	25 white chalcedony flakes	3	NE	
-6768	GM-34	3 chipping stations	Sta A: 16 red chalcedony flakes + 3 cores; Sta B: 11 red chalcedony flakes + 1 core; Sta C: 9 red rhyolite flakes + 1 core	71	NE	
-6769	GM-35	chipping station isolated core	18 flakes	120	NE	
-6770	GM-36	quarry 5 chipping stations	Sta A: 10 rhyolite flakes; Sta B: 10 rhyolite flakes; Sta C: rhyolite and chalcedony flakes; Sta D: chalcedony flakes; Sta E: flakes	2,400	E	
-6771	GM-37	chipping station	23 white chalcedony flakes	1,058	NE	
-6772	GM-38	2 chipping stations	Sta A: 17 white chalcedony flakes; Sta B: 11 white chalcedony flakes + 1 core fragment	24	NE	
-6773	GM-39	4 chipping stations	Sta A: 9 flakes + 1 core fragment; Sta B: 9 flakes, 2 core fragments, 1 nodule test; Sta C: 4 flakes, 1 core fragment; Sta D: 6 white chert flakes	1,300	NE	
-6774	GM-40	rock ring	none	2.89	NE	
-6775	GM-41	2 chipping stations	Sta A: 28 white chalcedony flakes; Sta B: 20 white chalcedony angular debris flakes	16	NE	
-6776	GM-42	chipping station	3 white chalcedony flakes	1	NE	
-6777	GM-43	chipping station	8± white chalcedony flakes	1	NE	

TABLE 1
GOSSER/MESQUITE LAND EXCHANGE
ARCHAEOLOGICAL SITES

IMP TRI #	Temp #	Site Type	Artifacts	Area M²	NR Status	Comments
-6778	GM-44	2 chipping stations low density lithic scatter	Sta A: 100± flakes; Sta B: 50± flakes core fragments	1,200	NE	
-6779	GM-45	quarry	thousands of red/orange chalcedony flakes	5,850	E	
-6780	GM-46	ridge with exposed chalcedony quarry veins	none	6,000	NE	Highly disturbed by modern mining.
-6807-I	I-2	white chalcedony stage 1 biface	N/A	1	NE	
-6808-I	I-3	red chalcedony or rhyolite uniface	N/A	1	NE	
		T 9S R 19E Section 11				
-6781	GM-47	2 chipping stations	Sta A: 5 rhyolite flakes; Sta B: 17 chalcedony flakes	8	I	50 meters north of trail GM-52.
-6782	GM-48	chipping station	26 red chert and rhyolite flakes	6	I	Associated with trail GM-52.
-6783	GM-49	chipping station	23 chalcedony flakes + 1 core	1	I	Associated with trail GM-52.
-6784	GM-50	chipping station	30 chalcedony flakes + 2 core fragments	1	I	Associated with trail GM-52.
-6785	GM-51	2 chipping stations	Sta A: 16 white chalcedony flakes; Sta B: 4 rhyolite flakes	100	I	50 meters north of trail GM-52.
-6786	GM-52	trail pottery scatter	pot sherds (Tizon)	163	I	East-west running trail with associated pot drops and chipping stations.
-6787	GM-53	3 chipping stations	Sta A: 35 white chalcedony flakes + 1 core fragment; Sta B: 11 basalt flakes; Sta C: 11 white chalcedony flakes + 1 multangular core	2,400	I	Associated with trail GM-52.
-6788	GM-54	pottery scatter chipping station	Pottery scatter: 15 Tizon brownware sherds; Chipping station: 13 white chalcedony and red rhyolite flakes	2.25	I	2.5 meters south of trail GM-52.
-6789	GM-55	2 chipping stations	Sta A: 50 flakes of green metavolcanic, 1 multiangular core; 1 piece of possible shell (*Laevicardium elatum*)	612.5	I	Near trail GM-52.

TABLE 1
GOSSER/MESQUITE LAND EXCHANGE
ARCHAEOLOGICAL SITES

IMP TRI #	Temp #	Site Type	Artifacts	Area M²	NR Status	Comments
-6790	GM-56	3 pottery scatters	Pot A: 50± sherds (Tumco); Pot B: 15± sherds (Topoc); Pot C: 30± sherds of (Parker)	637.5	I	On trail GM-52.
-6791	GM-57	chipping station	6 white chalcedony flakes	2	NE	
-6792	GM-58	chipping station	6 basalt flakes + 1 large bidirectional core	1	NE	
-6793	GM-59	chipping station pottery scatter	CS: 20 red rhyolite flakes; PS: 50+ sherds with rims (Topoc)	1,600	I	Next to trail GM-52.
-6794	GM-60	2 chipping stations	Sta A: 26 gray chalcedony flakes; Sta B: 14 white chalcedony flakes	350	NE	
-6795	GM-61	2 chipping stations	Sta A: 9 rhyolite flakes, 14 white chalcedony flakes; Sta B: 8 brown chalcedony flakes	300	NE	
-6796	GM-62	rock wall enclosure	none	6.6	NE	Probably modern construction.
-6797	GM-63	5 chipping stations	Sta A: 9 chalcedony flakes; Sta B: 20 rhyolite and chalcedony flakes + 1 core; Sta C: 20 rhyolite flakes; Sta D: 50± basalt flakes + 1 core; Sta E: 24 white chalcedony flakes	4,000	I	
-6798	GM-64	rock ring	1 biface	3	I	
-6799	GM-65	chipping station	11 white chalcedony flakes	2	NE	
-6800	GM-66	rock ring	none	1.96	NE	
-6801	GM-67	cleared circle	none	4.62	NE	
-6802	GM-68	2 chipping stations	Sta A: 13 white chalcedony flakes; Sta B: 25 yellow basalt flakes	3,600	NE	
-6803	GM-69	2 chipping stations	Sta A: 10 white chalcedony flakes Sta B: 12 brown rhyolite flakes	2	NE	

TABLE 1
GOSSER/MESQUITE LAND EXCHANGE
ARCHAEOLOGICAL SITES

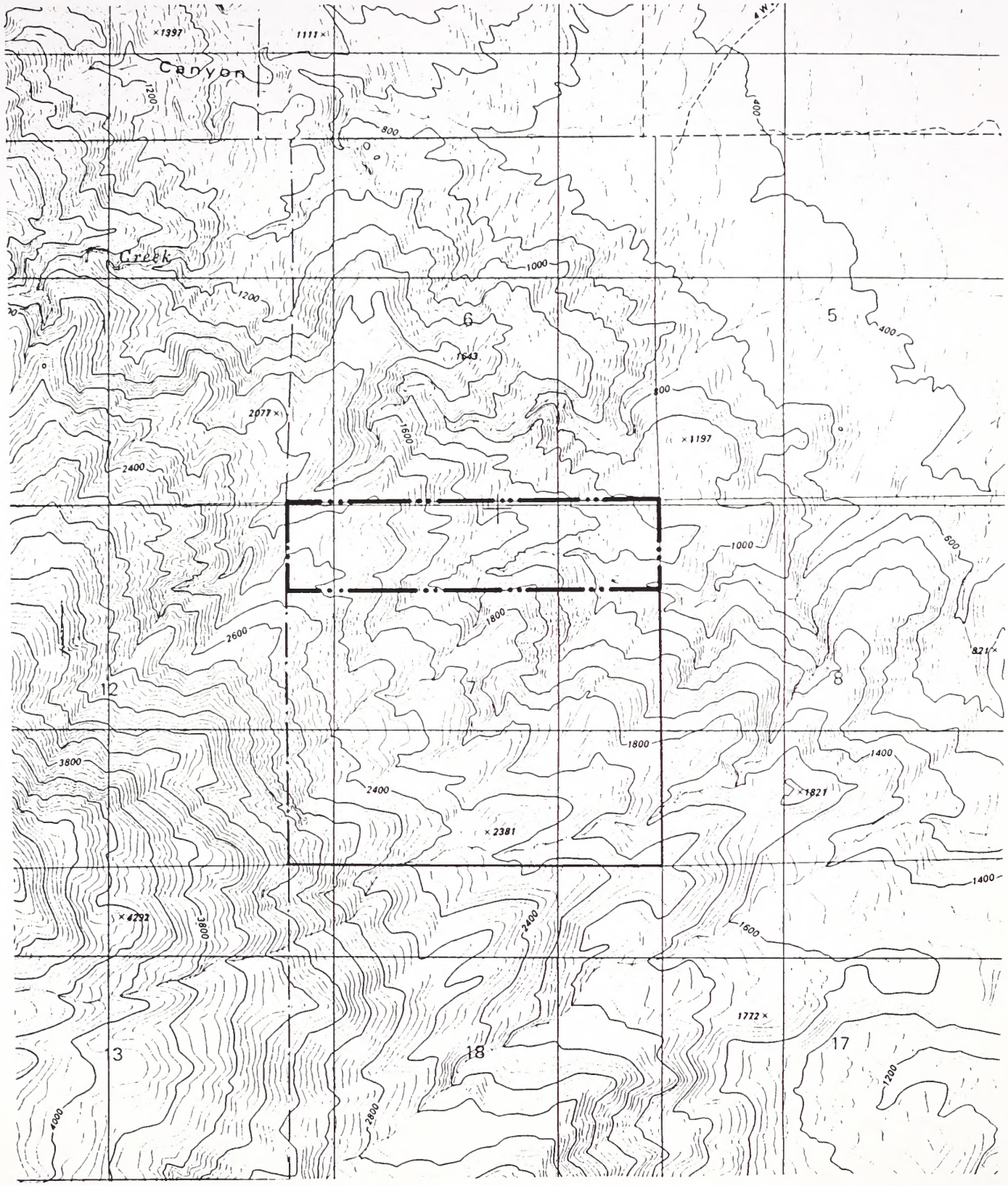
IMP TRI #	Temp #	Site Type	Artifacts	Area M²	NR Status	Comments
-6834	GM-70	boulder metate (non-portable)	basalt boulder metate	.08	NE	
-6805	GM-71	rock ring 3 chipping stations	Sta A: 30 basalt flakes; Sta B: 6 basalt flakes; Sta C: 28 chalcedony flakes	1,200	I	

* NR Status: The recommended NR status is provided. SHPO/BLM consultation pursuant to the Section 106 process has not been initiated.
E - Eligible; I - Indeterminate; NE - Not Eligible

Figure 5 - Section 1 Archaeological Sites (Confidential -- See Volume II)

Figure 6 - Section 11 Archaeological Sites (Confidential -- See Volume II)

Figure 7 - Section 21 Archaeological Sites (Confidential -- See Volume II)



Santa Rosa Mountain Survey Area
Section 7

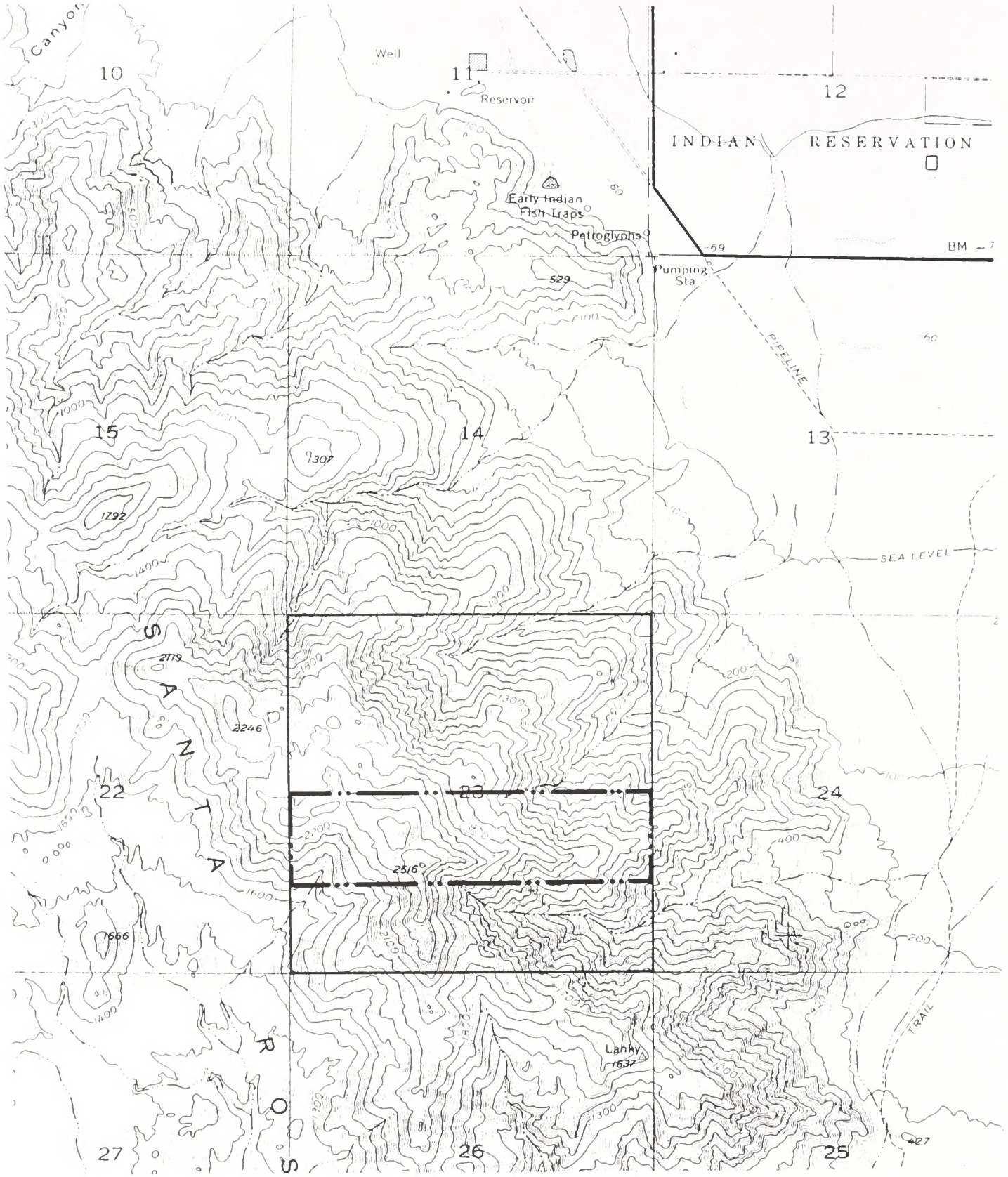
Figure 8

Brian F. Mooney Associates

N

0 1000' 2000'

SOURCE: U.S.G.S. 7.5' Quad (Martinez Mountain)



Santa Rosa Mountain Survey Area
Section 23

Brian F. Mooney Associates

N

0 1000' 2000'

Figure 9

SOURCE: U.S.G.S. 7.5' Quad (Valerie)

Lithics

Section 1. Ten sites were recorded in Section 1, mostly located in the southeast quarter, at the base of a small mountain, on well developed desert pavement areas. Most of this section is composed of active wash areas with bar and swell topography which provided little or no usable lithic materials. Among the sites recorded were five chipping stations of rhyolite and chalcedony flakes. Most of the debitage was well embedded in the desert pavement and exhibited dark patina that suggested great antiquity. Some of these sites may have been associated with an east/west running aboriginal trail (GM-3) that was located on the desert pavement areas adjacent and south of the large wash. Others sites were recorded on or near several trails leading over a small pass towards Tadpole Tank. Chipping stations found in this section include GM-1, GM-2, GM-5, and GM-7.

Typical of lithic procurement sites found in Section 1 was GM-1, a chipping station that was made up of red and tan chalcedony flakes including thirteen interior, five secondary, twelve primary flakes and one core fragment. All artifacts were well embedded in the desert pavement and were well varnished. A possible cleared circle with a cobble berm was located eight meters northeast of the scatter. This site was in the general vicinity of an east/west running trail (GM-3)

Section 11. Lithic stations in Section 11, were primarily limited to older Pleistocene Period pavement areas found in the northern part of the section just south of a large wash area. No sites were recorded in the southern half of the section which was composed of volcanic tuffs and very poor rhyolites. Many of the sites were located on or near an east/west running aboriginal trail(GM-52) in the northern part of the section. A total of thirty-three chipping stations and associated lithic scatters were recorded in this section. As with other lithic procurement sites found in the area, the sites in Section 11 also appeared to be primarily the product of core reduction or testing of various chalcedony and rhyolite materials found on the older desert pavements.

Most sites were composed of one or two small chipping stations of twenty-two to fifty pieces of debitage, predominantly primary and secondary flakes. A typical site from this section would be GM-49: a small chipping station within a one square meter area located on desert pavement near a small drainage and forty meters north of a trail. It was composed of one primary flake, fifteen secondary flakes, six interior flakes, one piece of angular debris, and one core fragment of heavily patinated and well embedded chalcedony.

GM-53, was located twenty meters south of an aboriginal trail on the slope of a desert pavement terrace, twenty meters south of an aboriginal trail, and consisted of three separate chipping stations in a 2,400 square meter area. Two of the stations consisted of waste debitage of white chalcedony that showed little patination and was not embedded in the pavement. Station A had eighteen secondary flakes, twelve interior flakes, five pieces of angular debris, and one core fragment in a one meter square area. Station B was located forty meters south of Station A and consisted of nine secondary and two interior flakes of basalt. Station C was found sixty meters west of station B and was comprised of six secondary flakes, four interior flakes, one piece angular debris and one multidirectional core of white chalcedony.

A cluster of five chipping stations made up GM-63. This site was situated on a desert pavement west of a small knoll and south of a large wash. All five stations were within a 100 by 40 meter area. Three kinds of lithic materials were present: chalcedony, rhyolite, and basalt. Most of the debitage was heavily patinated and well embedded in the desert pavement. Flake types were predominantly primary and secondary. Several cores or core fragments were present as well. Debitage waste types and the kinds of assemblages were suggestive of test knapping of various materials found on the desert pavement. No tools or preforms were found.

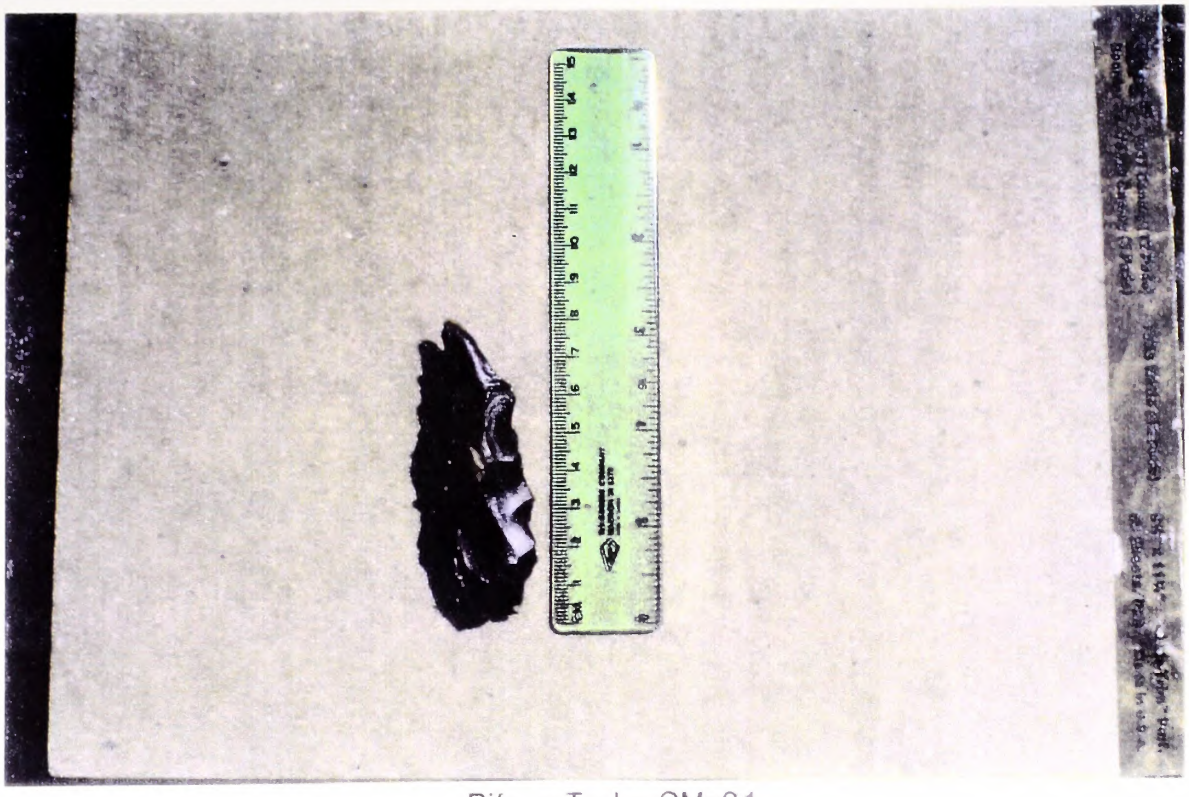
Section 21. Lithic materials were abundant in this section, where over fifty chipping stations and five quarries were recorded. The Tertiary Period volcanics of the Black Hills area, where this section is located, are the predominant source of rhyolite and chalcedony materials found in exposed veins and as nodules on the desert pavement. Most of the sites were found at the lower elevations on desert pavement areas and on small rolling hills adjacent to the larger mountains. These mountains are composed primarily of proclastic volcanics, while the Quaternary Period alluvial terraces at the base of the mountains consist of punky mixtures of highly weathered rocks including chalcedony, rhyolite, and basalt.

Quarries were found on desert pavement terraces, where testing of chalcedony and rhyolite nodules was excavated at exposed veins and ridges containing these materials. GM-45 is an example of the latter type of quarry. The site was located on top of a terraced volcanic ridge on the western edge of the project area. It extends along a ridge some ninety meters by sixty-five meters or 5,850 square meters and was primarily an exposed outcrop of several chalcedony veins. Modern rock knapping has occurred here in recent times and has impacted the site. However there are thousands of red and orange chalcedony pieces of debitage that exhibit various degrees of patination. There were two concentrations of lithics which included large numbers of flakes, angular debris, and core fragments.

Another example of a quarry site is GM-19, located in the northeast quarter of the section. It is situated along a desert pavement area that is bisected by a north/south running wash. A small knoll or ridge borders on the east side of the site. A north/south running trail (GM-20) is located on the west side of the site. The site consists of a low density lithic scatter with eight chipping stations. The material source for these reduction stations appear to be the chalcedony and rhyolite nodules found on the desert pavement. Other quarry sites in this section include GM-19, GM-29, GM-36, and GM-45.

The over fifty chipping stations found within Section 21 were very homogeneous and redundant, characterized by core test knapping and reduction debris of chalcedony and rhyolite materials. Only one core based tool at GM-31 was found; this was the only near diagnostic apparently finished tool found in the study area. Because of the site redundancy, only a few sites are described below.

GM-31 was located on a desert pavement covered terrace, situated between two large washes. A prehistoric trail (GM-27) was found twenty meters to the north, while several tanks or *tinajas* are just to the east. The site consisted of four chipping stations of rhyolite and chalcedony. Debitage was predominantly primary and secondary flakes, and there were several multi-directional cores. Various degrees of patination and embeddedness in the pavement were observed suggesting different temporal periods of production. A well patinated biface was observed (Figure 10).



Biface Tool – GM-31

Quarry Area – GM-45

Lithics

Figure 10

2. Rock Rings and Alignments

Cleared circles and rock ring alignments are very common throughout the Colorado Desert (Brown and Stone 1982; Carrico and Quillen 1982; Pendleton 1984). In the Picacho Basin near Yuma, south of the study area, 210 cleared areas were recorded at twenty-seven sites (Pendleton 1984:175). Based on an extensive excavation and recording program, Pendleton concluded that the function of the features could not be determined (1984:180). They could variously be: temporary dwellings, the results of plants growing in the center of an area, the result of local hydrology, clearings for lithic reduction, or any number unknown factors. An additional element, relevant to the current project vicinity, was the use of the area by military troops for training maneuvers during World War II. The area has been nationally known as a gem and mineral collecting area since the 1940s and many campsites and various features can be attributed to those kinds of activities as well. Some of the cleared areas and rock alignments can no doubt be attributed to these kinds of activities that have occurred in the last fifty years.

Schaefer (1986:67-86) has studied fifteen circular arrangements or rock rings at nine sites located in the Gold Fields/Mesquite area, near Glamis, California. Schaefer attempted to determine if rock rings and cleared circles are possibly the remains of temporary encampments, the foundations of small shelters from which aboriginal peoples exploited various resources in the general vicinity. Presumably artifacts reflecting these kinds of activities associated with a small camp site would be present. He found that artifact assemblages found near rock rings did not contain tools or utilized flakes that might be associated with camp maintenance, but rather were characteristic of the primary quarrying and reduction activities found throughout the general area. Schaefer also found no subsurface remains in association with any cleared circles or rock rings.

Of the seventy-one sites recorded for the three project areas (Sections 1, 11, and 21), nine rock rings and four cleared circles (Figure 11) were located. Three rock rings and three cleared circles were recorded in Section 1, three rock rings and one cleared circle in Section 11, and two rock rings in Section 21. It is of interest to note that the highest concentration of rock rings and cleared circles were found in Section 1 on a desert pavement adjoining a large wash system. Section 21, which had the largest concentration of lithic procurement sites (over fifty chipping stations and five quarries) of the three study areas had only two rock rings and no cleared circles. Approximately sixty percent of the rock rings had lithics associated with them. The lithic assemblages were characteristically testing and first stage reduction. Several site examples are provided below.

GM-5 was located in the southern portion of Section 1, on a desert pavement terrace near a small wash. It was an irregular shaped (2.5 meters in diameter), collapsed, rock ring that was well embedded in the desert pavement. It has openings at both the east and west ends. A chipping station was found in the center of the ring and consisted of at least thirty-four flakes of extremely well patinated and well embedded rhyolite flakes.

GM-71 was composed of a rock ring in association with two basalt and one chalcedony chipping stations. It was situated on several small terraces at the base of a mountain over looking a wash in the northeast quarter of Section 11. The ring was 2.5 meters in diameter and was composed of large and small well patinated basalt boulders. It was clear in the center with partial pavement redevelopment. The three chipping stations were located within fifty meters of the ring.

Rock Ring (GM-66) Looking North

Rock Ring (GM-5) Looking West

Brian F. Mooney Associates

Rock Rings

Figure 11

GM-28 was a site made up of four chipping stations and a rock ring, situated on and about a small knoll in an area of rolling hills in the southern part of Section 21. The rock ring was three meters in diameter, was composed of forty or fifty medium sized rocks, and was located at the top of the knoll. A cleared circle was located in the center of the ring. The four chipping stations were dispersed along the slopes of the knoll within a low density lithic scatter. The chipping stations were made up of various kinds of chalcedony, were embedded in the desert pavement, and displayed only moderate patination. Secondary flakes predominated in this assemblage.

3. Trails and Pot Drops

Aboriginal trails were used extensively throughout the Colorado Desert area for trade routes, access to hunting and collecting localities, seasonal migrations, war parties, and for general movement throughout the area. Major routes that moved north-south along the Colorado River existed to the east of the project area, while a few miles to north was the Cocomaricopa trail system that connected the Colorado River peoples with the Coachella Valley and on west to the coast. Various sites and features are often found along these trails including pot drops, chipping stations, rock rings, rock art, temporary camp sites, and rock cairns. Trails connected both permanent springs and more ephemeral water sources such as tanks or *tinajas*.

Historical trails often followed older aboriginal trails as the Euro-American presence came to dominate the area after the 1860s. The well travelled Bradshaw Trail, which connected the Colorado River near present day Blythe with the Coachella Valley and Riverside areas is located only a few miles north of the project area. The Niland - Salvation Pass - Blyth Road passed in the general vicinity of the project area and provided access to Imperial Valley through the Chocolate Mountains. A records check with the Imperial Valley Museum indicated that portions of a historic wagon road (IMP-3242 and IMP-3243H) are shown on a 1856 USGLO survey map by H.S. Washburn in the southwest corner of Section 1. These wagon tracks were not found during the current survey. The old wagon road may in fact be under the existing modern dirt road that is located in the southern portion of the section. No historical items were found in association with any of the roads.

Six prehistoric trails or trail segments were found in the three studied sections (Figure 12). Several trails provide access to the Tadpole Tank area just a few miles to the east of the project area while others connect with the Malpitas Wash to the south on to tanks in Section 21. In all cases the trails are well embedded in the desert pavement and average approximately thirty centimeters in width. Sites and features associated with the trails in the study area included chipping stations, pot drops, rock rings, and cleared circles. A section by section description of trails is provided below. Pot drops are treated separately at the end of this discussion.

Trails

Section 1. Three trail segments were recorded in this section, two of which extend out of a small pass area from the Tadpole Tank area to the southeast. GM-3 was a small trail segment located on a desert pavement terrace south of Sand Wash. The trail was well embedded in the desert pavement, which has partially reformed in the center of the trail. A cluster of sites, including a number of chipping stations, a rock ring, and several cleared circles were located in the general vicinity of the trail.

Trail GM-6 (Section 1) Looking Northwest

GM-6 and GM-9 were two trails leading out of a pass area from Tadpole Tank towards Sand Wash. Tadpole Tanks would have provided prehistoric peoples with an important but ephemeral water source. Several rock rings and chipping stations were also associated with these trails.

Section 11. One trail, (GM-52), was recorded in Section 11. Traversing in an east/west direction across the northern half of the section, it was located on a number of well developed desert pavement areas that parallel the edge of Sand Wash basin. Thirteen sites (GM 47-59), including a series of pot drops and chipping stations, were recorded on or close to this trail.

Section 21. Four trails were recorded in Section 21. All run in a north/south direction through the section. The general area appears to have been heavily used by prehistoric peoples for quarrying and lithic procurement. A number of ephemeral tanks or *tinajas* are also located in the vicinity. Two trails (GM-27 and GM-20) lead into the tank area in the northern part of the section and are directly related to a good size tank there. These segments appear to lead south to Milpitas Wash and north to an unknown destination. As expected, a number of chipping stations were found on or close to the trails. However, it is of interest to note that no pot drops were found associated with these trails.

Pot Drops

All the ceramic scatters or pot drops recorded during the current study were found along the east/west running trail (GM-52) in Section 11. GM-56 was a series of pot drops of different ceramic types along a seventy-five meter segment of the trail. Pot drop A consisted of over fifty sherds of Tumco or Black Mesa Buff. Several bowl rims were present. Pot drop B was fifteen sherds of Topoc Buff including a recurved rim fragment of an olla. Pot drop C was composed of at least thirty sherds of Parker Buff. Samples were collected from each pot drop and examined by Jerry Schaefer using Waters ceramic topology (1982b). Temporal placement of the three pot drops ranges from Patayan I-II (Black Mesa or Tumco Buff) to Patayan II and III (Parker Buff) suggesting that the trail had been used by aboriginal peoples from 800 A.D. to ethnohistoric times. A pot drop at GM-59, located on the eastern end of the trail where it drops down into a wash, was identified as Topoc Buff, a type associated with the Patayan II period. A straight rim sherd from a small olla was collected from this site. Two other pot drops, GM-52 and GM-54, were identified as Tizon Brownware.

In sum, of the six pot drops found during the current survey all were associated with trail GM-52. Types found at the pot drops included two Topoc Buff, two Tizon Buff, one Tumco Buff, and one Parker Buff. The chronological time frame ranges from Patayan I through the ethnohistoric periods.

B. Summary

The way hunters and gatherers adapted to marginal desert environments can be inferred by the type and distribution of material remains that they left behind. The Chuckwalla Basin was an area characterized by prolonged aridity where critical resources were limited and widely dispersed. This desert region remained peripheral to the more dynamic and diverse habitats along the Colorado River and the Lake Cahuilla shoreline in the Salton Trough. Fluctuations in Colorado River flood cycles, localized and irregular precipitation, and cultural factors such as tribal alliances, warfare, and trade influenced the intensity, periodicity, and variability of activities in the project area. As a result,

cultural resources within the arbitrary and limited confines of the project area must be assessed for scientific significance within a regional context that encompasses the larger effective hunter-gatherer territorial boundaries. For example, a trail running through a one mile square section may not appear to be significant until it is followed for many miles to an important spring, ceremonial center, or resource collection zone. Most of the pot drops, lithic scatters, and other evidence of trail-side behavior thus represents the activities of people passing through the area. In another example, one piece of *Laevicardium elatum* shell was found at a trail-side chipping station site (GM-55). This marine species was derived from either the Gulf of Califomia or Pacific Coast (Morris 1952). Sedentary Period Hohokam shell manufacturing sites and trade routes have been recorded in the Salt-Gila Basin and the Westem Papagueria of southem Arizona (McGuire and Schiffer 1982:191,192,241,249; Gross 1988), with most of the shell derived from the Gulf of Califomia. How the Patayan in Califomia participated in this trade network has not been so fully examined as it has in Arizona. The large, unworked fragment from GM-55 may represent one of the raw materials that was traded by prehistoric travellers, who used the adjoining trail (GM-52). Chipping stations, quarries, cleared circles, and other features in the project area represent short-term activities of hunters and gatherers who were based in more optimal areas at springs, major washes, or along the Colorado River. Ground stone was almost absent from the region, indicating that the project area was not a principal zone for seed collecting.

Chronometric control is another problematic element of interpreting desert sites. Most sites cannot be ascribed to a specific time period. Heavily varnished lithics suggest great antiquity and a possible San Dieguito or Archaic Pattern association. Only site GM-31 produced a heavily varnished biface that may be attributed, with some caution, to the San Dieguito Pattern. Only one boulder metate (GM-70) was located, and this unmodified boulder exhibited only minor evidence of grinding. This find presumably belongs to either the Archaic, Late Prehistoric, or Ethnohistoric Pattern. Only the ceramic pot drops provide incontrovertible evidence for Late Prehistoric and Ethnohistoric use of the area. The fact that almost all pot drops and ceramic finds occurred along trails suggest that the project area was principally part of a transport corridor in the latter periods. These peoples presumably stopped only briefly to procure raw lithic material or exploit local plant and animal resources. They certainly did not stay long enough at any other localities to use, break, and discard any ceramic items.

The following associations were found among site types and natural or topographic features:

1. North-south oriented trails pass through the project area or lead to Tadpole Tank from Section 1, an unnamed tank in Section 21, or connect Sand Wash and Milpitas Wash.

2. An east-west trail that had the majority of Late Prehistoric pot drops followed the southem perimeter of the Sand Wash basin.

3. Rock rings, cleared circles, and some chipping stations occur on Quaternary Period alluvial terraces overlooking large sandy washes, particularly adjoining the southem edge of the Sand Wash basin in the north portion of Section 11 and the southeast quarter of Section 1.

4. Quarries and great numbers of chipping stations occur on Quaternary Period alluvial terraces that contain concentrations of silicates. These can be found in the southern quarter and central portions of Section 21.

V. RECOMMENDATIONS

A. Impact Projections

Only a preliminary significance analysis is presented below because the sites under consideration are to be transferred from private property to the public domain. Therefore, no impacts are projected from the proposed land exchange. In fact, the sites will gain protection under the National Historic Preservation Act of 1966, Archaeological Resources Protection Act of 1979 (ARPA; P.L. 96-95; 93 Stat. 721; 16 U.S.C. 470aa *et seq.*), the Federal Land Policy and Management Act of 1976 (FLPMA; P.L. 94-579; 90 Stat. 2743; 43 U.S.C. 1701 *et seq.*), as well as the American Antiquities Act of 1906, the American Indian Religious Freedom Act, and Title 43 Code of Federal Regulations. ARPA and FLPMA specifically require permits to conduct archaeological investigations and provide the legal apparatus to prosecute violators. Once under BLM authority, any future proposed discretionary actions or proposed projects would require archaeological evaluations as specified by the Advisory Council on Historic Preservation regulations (36 CFR 800) for implementation of Section 106 of the National Historic Preservation Act of 1966 (NHPA; P.L. 89-665; 80 Stat. 915; 16 U.S.C. 470).

B. Significance Evaluations

The often quoted criteria for determining National Register eligibility pursuant to the National Historic Preservation Act of 1966 have become the standard for evaluating significance. As published in the *Federal Register* (November 16, 1981, 46(220):50189) they are stated as:

> The quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures, and objectives of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association and:
>
> a. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> b. That are associated with the lives of persons significant in our past; or
>
> c. That embody the distinctive characteristics or a type, period, method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> d. That have yielded, or may be likely to yield, information important in prehistory or history.

Only criterion "d" applies to the sites in the project area. Those sites with greater quantity and variability of cultural resources were assessed as more significant because they offer greater numbers of cultural and artifact associations with which to develop testable hypotheses. Isolates and small isolated chipping stations (groupings of 1-4 chipping stations, depending on the number of flakes and

cores), rock rings, and cleared circles without diagnostic tools were, therefore, considered to have low significance and to be "not eligible" for inclusion on the National Register of Historic Places. Despite these preliminary recommendations, any future data recovery programs in the project area may need to include some of these sites to fully understand hunter-gatherer behavior. As specified in Table 1, there are forty-five recorded cultural resources provisionally given "not eligible" recommendations.

Trails and sites with apparent associations with trails (chipping stations, pot drops, rock rings) were given "indeterminate" status for National Register eligibility because only portions of the trails were recorded and more detailed investigations are warranted to trace their extent and to determine if the trails are associated with major springs, tanks or ceremonial features. The fact that rock features, lithic scatters, and pot drops were found in direct association with these trails makes them more significant. Indeed, Malcolm Rogers used the "horizontal seriation" of trail systems in the Colorado Desert to derive the first relative chronology of Buff Ware ceramics that is the basis for current ceramic typologies and regional Patayan cultural chronology (Rogers 1945, Waters 1982). Additional testing is therefore warranted to determine if the chronology of trail use, rates of use, and direction of travel can be determined. Three sites were also included in the indeterminate category; they included an association of rock rings with chipping stations or contained diagnostics. These sites comprised GM-28, 31, and 71. Table 1 indicates all twenty-three sites with "indeterminate" National Register evaluations.

Lithic quarries were the only sites given "eligible" recommendations because they contain large quantities of artifacts, usually over a relatively large area, and contain sufficient data with which to apply quantitative approaches to the study of lithic reduction technology. Any examination of these sites, however, may also find useful comparisons with isolated chipping stations. Quarries comprise sites GM-29, 36, and 45.

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TECHNICAL APPENDICES

APPENDIX E-3 CONFIDENTIAL APPENDICES TO CULTURAL RESOURCE INVENTORIES FOR THE PROPOSED MESQUITE LANDFILL PROJECT AREA AND THE PROPOSED GOSSER PROPERTIES

A copy of Appendix E-3, Cultural Resource Inventories for the Proposed Mesquite Landfill Project Area and the Proposed Gosser Properties is available for review at:

COUNTY OF IMPERIAL
Planning and Building Department
939 Main Street
El Centro, California

and

BUREAU OF LAND MANAGEMENT
California Desert District
1661 S. 4th Street
El Centro, California

January 1994

MESQUITE REGIONAL LANDFILL EIS/EIR

APPENDIX G

VISUAL RESOURCES CONTRAST RATING SHEETS

JANUARY 1994

APPENDIX G
VISUAL RESOURCES CONTRAST RATING SHEETS

for the proposed

MESQUITE REGIONAL LANDFILL

IMPERIAL COUNTY, CALIFORNIA

SCH. No. 92051024
BLM No. CA-060-02-5440-10-B026

prepared for

BUREAU OF LAND MANAGEMENT
California Desert District
1661 S. 4th Street
El Centro, California

and

COUNTY OF IMPERIAL
Planning And Building Department
939 Main Street
El Centro, California

January 1994

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

I. Introduction.

A. Overview. The contrast rating system is a systematic process used by the Bureau of Land Management (BLM) to analyze potential visual impacts of proposed projects and activities. It is primarily intended to assist Bureau personnel who are not formally trained in the design arts to apply the basic principles of design in the resolution of visual impacts. It is not intended to be the only means of resolving these impacts. It should be used as a guide, tempered by common sense, to ensure that every attempt is made to minimize potential visual impacts. The basic philosophy underlying the system is: The degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape. The contrast can be measured by comparing the project features with the major features in the existing landscape. The basic design elements of form, line, color, and texture are used to make this comparison and to describe the visual contrast created by the project. This assessment process provides a means for determining visual impacts and for identifying measures to mitigate these impacts.

II. Steps in the Contrast Rating Process.

A. Obtain Project Description. To effectively evaluate the visual impacts of a proposed project, a detailed project description is needed. Appendix 1 provides guidance on the type of information needed. The level of detail required in the description should be commensurate with the type of project proposed. This information is usually supplied by the project sponsor for BLM-initiated projects or by the applicant for non-Bureau of Land Management initiated projects.

B. Identify VRM Objectives. Use the RMP generated objectives when available. Where there are no RMP approved objectives, interim Visual Resource Management (VRM) classes will be developed using the guidelines in Handbook H-8410-1 except: (1) The inventory will be limited to the area affected by the project; and (2) the VRM classes will reflect the management decision made in existing RMP's. An RMP amendment is not required unless the project that is driving the evaluation requires an amendment.

C. Select Key Observation Points (KOP's). The contrast rating is done from the most critical viewpoints. This is usually along commonly traveled routes or at other likely observation points. Factors that should be considered in selecting KOP's are; angle of observation, number of viewers, length of time the project is in view, relative project size, season of use, and light conditions (see Section IIID2b for a more detailed description of these factors). Linear projects such as powerlines should be rated from several viewpoints representing:

- Most critical viewpoints, e.g., views from communities, road crossings.
- Typical views encountered in representative landscapes, if not covered by critical viewpoints.
- Any special project or landscape features such as skyline crossings, river crossings, substations, etc.

D. Prepare Visual Simulations. Visual simulations are an invaluable tool in effectively evaluating the impacts of a proposed project (see Illustration 1). Simulations are strongly recommended for potentially high impact projects. The level of sophistication should be commensurate with the quality of the visual resource and the severity of the anticipated impact. Simulations are extremely important to portray the relative scale and extent of a project. They also help public groups visualize and respond to development proposals, making public participation in the planning process more effective. The BLM publication Visual Simulation Techniques should be consulted for the appropriate simulation methods.

E. Complete the Contrast Rating. Complete contrast rating from key observation point(s) using Bureau Form 8400-4 - Visual Contrast Rating Worksheet (see Illustration 2).

III. Requirements for Completing the Contrast Rating Worksheet.

A. Project Information (Section A). Complete the background information requested. It is important to precisely record the location of the KOP. A sketch of the KOP/project location should be shown in the "location" block. If several different key observation points are used for the project evaluation, give each viewpoint a separate number for reference purposes.

B. Descriptions (Sections B and C). To properly assess the contrasts between the proposed and existing situation, it is necessary to break each down into the basic features (i.e., landform/water, vegetation, and structures) and basic elements (i.e., form, line, color, and texture) so that the specific features and elements that cause contrast can be accurately identified. When describing the project, be sure to include approved mitigating measures. Refer to Illustrations 3, 4, 5, and 6 for the suggested vocabulary for describing characteristic landscapes and the proposed projects.

C. Categorizing Projects Under Features (Sections B and C). It is sometimes difficult to determine which type feature a project fits under. Use the following as a guide to categorize projects:

Landform/Water Features	Vegetative Features	Structural Features
Roads	Timber Harvests	Transmission Lines
Mining	Grazing Systems	Generation Plants
Gravel Pits	Vegetative Manipulations	Oil and Gas Developments
Landfills		Recreation Facilities
Water Impoundments		Water Tanks
		Microwave Stations
		Buildings

D. Contrast Rating (Section D). The actual rating should be completed in the field from the KOP(s). It can be done as a team effort or individually, depending on the sensitivity and impacts of the project and the availability of personnel (see Manual Section 8431.12). If done as a team, it is best to do the ratings individually and then compare ratings. A simulation should be available to show scale, relative placement of disturbing features, and other important information necessary to complete an objective rating.

1. Selecting the Timeframe. Projects may be rated on either a short-term or long-term basis. Short-term is through the first 5 years and long-term is through the life of the project. If the project has significantly different short-term and long-term effects, two contrast ratings should be completed using two separate forms. Check the appropriate block under section D on the rating form to indicate the term of the rating.

2. Rating the Degree of Contrast (Section D1). Using the matrix provided in section D of the form, rate the degree of contrast. Be sure to include the proposed mitigating measures and standard stipulations in the rating. The rating is completed by determining the degree of contrast (i.e., strong, moderate, weak, or none) for each element. Use the following general criteria and factors when rating the degree of contrast:

a. Degree of Contrast Criteria.

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

b. Factors to be considered. Consider the following factors when applying the criteria (see also Illustrations 3, 4, 5, and 6):

(1) Distance. The contrast created by a project usually is less as viewing distance increases.

(2) Angle of Observation. The apparent size of a project is directly related to the angle between the viewer's line-of-sight and the slope upon which the project is to take place. As this angle nears 90 degrees (vertical and horizontal), the maximum area is viewable.

(3) Length of Time the Project Is in View. If the viewer has only a brief glimpse of the project, the contrast may not be of great concern. If, however, the project is subject to view for a long period, as from an overlook, the contrast may be very significant.

(4) Relative Size or Scale. The contrast created by the project is directly related to its size and scale as compared to the surroundings in which it is placed (see Illustration 7).

(5) Season of Use. Contrast ratings should consider the physical conditions that exist during the heaviest or most critical visitor use season, such as snow cover and tree defoliation during the winter, leaf color in the fall, and lush vegetation and flowering in the spring.

(6) Light Conditions. The amount of contrast can be substantially affected by the light conditions. The direction and angle of lighting can affect color intensity, reflection, shadow, form, texture, and many other visual aspects of the landscape. Light conditions during heavy use periods must be a consideration in contrast ratings.

(7) Recovery Time. The amount of time required for successful revegetation should be considered. Few projects meet the VRM management objectives during construction activities. Recovery usually takes several years and goes through several phrases (e.g., bare ground to grasses, to shrubs, to trees, etc.). It may be necessary to conduct contrast ratings for each of the phases that extend over long time periods. Those conducting contrast rating should verify the probability and timing of vegetative recovery.

(8) Spatial Relationships. The spacial relationship within a landscape is a major factor in determining the degree of contrast (see Illustration 8).

(9) Atmospheric Conditions. The visibility of projects due to atmospheric conditions such as air pollution or natural haze should be considered.

(10) Motion. Movement such as waterfalls, vehicles, or plumes draw attention to a project.

c. General Guidance for Accessing Contrast.

(1) Form. Contrast in form results from changes in the shape and mass of landforms or structures. The degree of change depends on how dissimilar the introduced forms are to those continuing to exist in the landscape.

(2) Line. Contrasts in line results from changes in edge types and interruption or introduction of edges, bands, and silhouette lines. New lines may differ in their subelements (boldness, complexity, and orientation) from existing lines.

(3) Color. Changes in value and hue tend to create the greatest contrast. Other factors such as chroma, reflectivity, color temperature, may also increase the contrast.

(4) Texture. Noticeable contrast in texture usually stems from differences in the grain, density, and internal contrast. Other factors such as irregularity and directional patterns of texture may affect the rating.

3. Determining Whether VRM Objectives are Met (Section D2). Compare the contrast ratings with the objectives for the approved VRM Class (see Appendix 2 for definitions of VRM classes). For comparative purposes, the four levels of contrast (i.e., none, weak, moderate, and strong) roughly correspond with classes I, II, III, and IV, respectively. This means that a "strong" contrast rating may be acceptable in a class IV area but probably would not meet the VRM objectives for a class III area. In making these comparisons, one must also look at the cumulative effect of all the contrast ratings. Certain combinations of ratings may indicate there is a stronger overall contrast than the individual ratings show. For example, several "moderate" ratings when viewed in combination may warrant an overall "strong" rating. This is a judgmental call that must be documented on the back side of the form. If the rater checks the "no" block on the form, indicating the VRM objectives are not met, the reasons for not meeting the objectives must also be documented on the back of the form.

4. Developing Additional Mitigating Measures (Section D3). Since the overall VRM goal is to minimize visual impacts, mitigating measures should be prepared for all adverse contrasts that can be reduced. This includes reduction of contrast in projects which have met the VRM objectives. Mitigating measures should be written so they can easily be extracted and used as stipulations in leases, permits, contracts, etc. When preparing mitigating measures, keep in mind the concepts of strategic location (in less visible and less sensitive areas), minimizing disturbance, and repetition of the basic elements (form, line, color, and texture). Also make sure that mitigating measures are realistic (i.e., do not propose revegetation where the probability of success is very low). Other suggestions for reducing contrast are shown in Appendix 3. The publications listed in the bibliography of Manual Section 8400 also provide additional guidance on mitigating measures.

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

Visual Contrast Rating Worksheet

Form 8400-4
(September 1985)

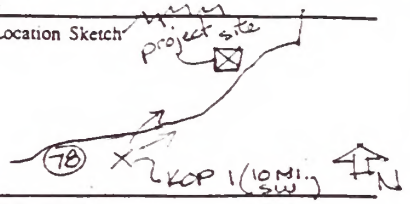
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 7.22.92
District EL CENTRO
Resource Area
Activity (program) CLASS III LANDFILL

SECTION A. PROJECT INFORMATION

1. Project Name MESQUITE REGIONAL LANDFILL
2. Key Observation Point (1)
3. VRM Class (PROJECT SITE) CLASS III (PARTIALLY II)
4. Location
Township
Range
Section
5. Location Sketch



SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	RANGES FROM FLAT, DESERT FLOOR TO MOUNTAINOUS	SIMPLE, IRREGULAR FORMS	NOT SEEN FROM THIS KOP (DNA)
LINE	PREDOM. HORIZONTALLY ORIENTED	IRREGULAR	
COLOR	DARK BROWN (MOUNTAINS) TAN/REDDISH BROWN (DESERT FLOOR) TAN OVERBURDEN PILES	YELLOW GREEN/GREEN & REDDISH BROWN	
TEXTURE	VARIED FROM SMOOTH TO MEDIUM	PATCHY, SCATTERED FINE, MEDIUM DENSITY	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION (NONE)	3. STRUCTURES
FORM	LARGE MASS, RESEMBLES HILL	∅	WOULD NOT BE SEEN FROM THIS KOP
LINE	SMOOTH, HORIZONTALLY ORIENTED CONTOURED	∅	(DNA)
COLOR	LIGHT TAN	∅	
TEXTURE	SMOOTH	∅	

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			X				X					X
Line			X				X					X
Color		X					X					X
Texture			X				X					X

2. Does project design meet visual resource management objectives? ☒ Yes ☐ No (Explain on reverse side)

3. Additional mitigating measures recommended ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names: ALEXANDRA MORRISON
Date: 7.22.92

CLASS III VISUAL RESOURCE - ALLOWS FOR MODERATE CHANGE TO T/ NATURAL LANDSCAPE. ACTIVITIES MAY ATTRACT ATTENTION, BUT SHOULD NOT DOMINATE THE VIEW OF THE CASUAL OBSERVER. CHANGES SHOULD REPEAT THE BASIC ELEMENTS FOUND IN T/ PREDOMINATE NATURAL FEATURES OF THE CHARACTERISTIC LANDSCAPE.

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

Visual Contrast Rating Worksheet

Form 8400-4
(September 1985)

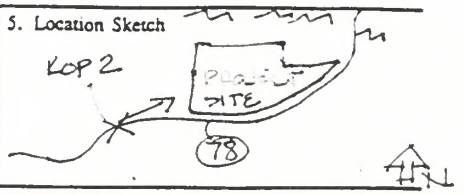
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 7.22.92
District EL CENTRO
Resource Area
Activity (program) CLASS III LANDFILL

SECTION A. PROJECT INFORMATION

1. Project Name: MESQUITE REGIONAL LANDFILL
2. Key Observation Point: (2)
3. VRM Class: CLASS III (PARTIALLY III)
4. Location: Township / Range / Section
5. Location Sketch:



SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	RANGES FROM FLAT, TO MOUNTAINOUS (DISTANT)	LOW-LYING, SIMPLE, IRREGULAR	NONE SEEN
LINE	HORIZONTALLY ORIENTED STRAIGHT TO RUGGED	IRREGULAR	FROM THIS KOP
COLOR	DK BROWN TO TAN & REDDISH BROWN	YELLOW-GREEN/BROWN/ GREEN	
TEXTURE	VARIED FROM SMOOTH TO MEDIUM	MEDIUM DENSITY MEDIUM GRAIN	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	LARGE, HILL-LIKE FORM (SOME VERTICAL IMPACT) HORIZONTALLY ORIENTED	Ø (NONE)	INDUSTRIAL MACHINERY (PARTIALLY SCREENED BY VEGETATION
LINE	BOLD AGAINST HORIZON IRREGULAR/CONTOURED SILHOUETTE	Ø	VERTICAL & HORIZ.
COLOR	LIGHT TAN	Ø	INDUSTRIAL/ GREYS TAN BLACK, ETC. TYP. LOW CHROMA
TEXTURE	SMOOTH W/ HORIZONTAL & DIAGONAL LINEAR PATTERN	Ø	TYP. SMOOTH

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form	X						X				X	
Line	X						X				X	
Color	X						X				X	
Texture	X						X				X	

2. Does project design meet visual resource management objectives? ☐ Yes ☒ No (Explain on reverse side)

3. Additional mitigating measures recommended ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names: ALEXANDRA MORRISON
Date: 7.22.92

Rel. 8-30
1/17/86

BLM MANUAL

The proposed landform would dominate views as the traveler on SR78 approaches the site. This would not meet VRM Class III objectives.

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

Visual Contrast Rating Worksheet

Form 8400-4
(September 1985)

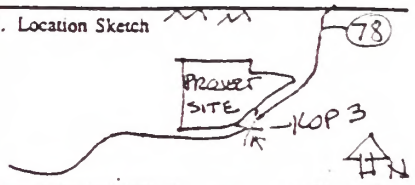
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date: 7-22-92
District: EL CENTRO
Resource Area:
Activity (program): CLASS III LANDFILL

SECTION A. PROJECT INFORMATION

1. Project Name: MESQUITE REGIONAL LANDFILL
2. Key Observation Point: (3)
3. VRM Class: CLASS III
4. Location: Township / Range / Section
5. Location Sketch:



SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	PREDOMINANTLY FLAT, FLAT-TOPPED HILLS (OVERBURDEN PILES)	PRIMARILY LOW-LYING, SIMPLE FORMS, IRREGULAR	NONE SEEN FROM THIS KOP
LINE	HORIZONTAL/ LINEAR/SOME ANGULAR	IRREGULAR/COMPLEX	
COLOR	DK BROWN (DISTANT PALISHEMT) TAN & REDDISH BROWN	YELLOW-GREEN/ REDISH BROWN/GREEN	
TEXTURE	FINE TO MEDIUM GRAIN.	MEDIUM DENSITY/ MEDIUM GRAIN	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	LARGE, HILL-LIKE FORM HORIZONTALLY ORIENTED (SOME VERTICAL IMPACT)	∅ (NONE)	INDUSTRIAL MACHINERY (PARTIALLY SCREENED BY VEGETATION)
LINE	BAD SILHOUETTE AGAINST HORIZON/ IRREGULAR & CONTRIVED	∅	VERTICAL & HORIZONTAL
COLOR	LIGHT TAN	∅	INDUSTRIAL/TYPICALLY LOW CHROMA
TEXTURE	SMOOTH W/ HORIZONTAL & DIAGONAL LINEAR PATTERN	∅	TYPICALLY SMOOTH

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form	X				X					X		
Line	X				X					X		
Color	X				X					X		
Texture	X				X						X	

2. Does project design meet visual resource management objectives? ☐ Yes ☒ No (Explain on reverse side)

3. Additional mitigating measures recommended ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names: ALEXANDRA MORRISON
Date: 7-22-92

Rel. 8-30
1/17/86

BLM MANUAL

From this KOP, the existing mine overburden and leached ore piles are barely noticeable. The proposed landform would dominate the views of travelers on SR78 looking north. This would not meet VRM Class III objectives.

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

Visual Contrast Rating Worksheet

Form 8400-4
(September 1985)

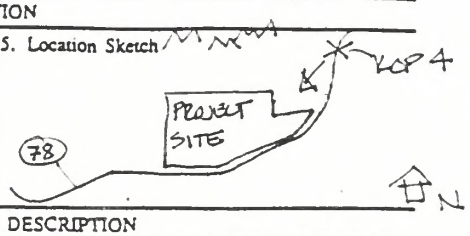
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date: 7-22-92
District: EL CENTRO
Resource Area:
Activity (program): CLASS II LANDFILL

SECTION A. PROJECT INFORMATION

1. Project Name: MESQUITE REGIONAL LANDFILL
2. Key Observation Point: (4)
3. VRM Class: CLASS II
4. Location
Township
Range
Section
5. Location Sketch



SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	RANGES FROM FLAT TO SERIES OF FLAT-TOPPED HILLS (OVERBURDEN PILES)	LOW-LYING, SIMPLE, IRREGULAR (*NONE ON OVERBURDEN PILES)	NONE SEEN FROM THIS KOP
LINE	HORIZONTALLY ORIENTED LINEAR/SOME ANGULAR	IRREGULAR	
COLOR	TAN REDDISH BROWN DK BROWN (CONICAL HILL)	YELLOW-GREEN/BROWN GREEN	
TEXTURE	FINE TO MEDIUM GRAIN	MEDIUM DENSITY MEDIUM GRAIN	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	HORIZONTALLY ORIENTED HEIGHT VARYS SOME VERTICAL IMPACT/LARGE HILL-LIKE FORM	Ø NONE	LANDFILL RELATED EQUIPMENT/FACILITIES
LINE	BOLD SILHOUTTE AGAINST HORIZON LINE (SMOOTH/IRREGULAR LINE)	Ø	WOULD NOT BE SEEN FROM THIS KOP
COLOR	LIGHT TAN	Ø	
TEXTURE	SMOOTH W/HORIZONTAL & DIAGONAL STRIPED PATTERN	Ø	

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

1. DEGREE OF CONTRAST

ELEMENTS	FEATURES: LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		X					X					X
Line		X					X					X
Color		X					X					X
Texture		X					X					X

2. Does project design meet visual resource management objectives? ☒ Yes ☐ No (Explain on reverse side) SEE KOP ①

3. Additional mitigating measures recommended ☐ Yes ☒ No (Explain on reverse side)

Evaluator's Names: ALEXANDRA MORRISON
Date: 7-22-92

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

Visual Contrast Rating Worksheet

Form 8400-4
(September 1985)

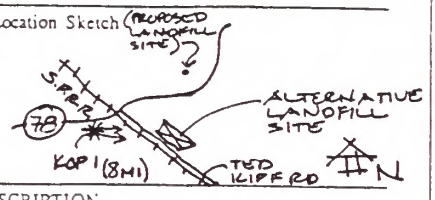
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date: 8·26·93
District: EL CENTRO
Resource Area: CALIFORNIA DESERT CONSERVATION AREA
Activity (program): CLASS III LANDFILL

SECTION A. PROJECT INFORMATION

1. Project Name: MESQUITE REGIONAL LANDFILL/ALTERNATIVE SITE
2. Key Observation Point: 1
3. VRM Class (VRM CLASS DOES NOT APPLY): MULTIPLE-USE CLASS M
4. Location: Township 13S/14S; Range 19E; Section —
5. Location Sketch



SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	VIEWSHED DOMINATED BY SAND DUNES IN MG & FG. FLAT DESERT FLOOR & CARRO MUCHACHO MOUNTAINS SEEN AS THIN BAND BETWEEN DUNES & SKY	NO DISTINGUISHABLE FORMS ARE OBSERVED FROM THIS KOP	NOT OBSERVED FROM THIS KOP
LINE	SMOOTH, SILHOUETTED HORIZONTALLY, ORIENTED LINES THREE DISTINCT BANDS: DUNES; DESERT FLOOR/MNTNS; & SKY	VEGETATION ON DESERT FLOOR BLENDS INTO HORIZONTAL BAND ALONG HORIZON.	
COLOR	LIGHT TAN IN FOREGROUND (DUNES). BLUE-GREY/BROWN-GREY @ HORIZON LINE.	BRUNISH GREY	
TEXTURE	RELATIVELY SMOOTH, FINE GRAIN	SMOOTH	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	LARGE, CONTOURED MASS, SIMILAR IN FORM TO A LARGE HILL.	NONE	WOULD NOT BE OBSERVED FROM THIS KOP
LINE	SMOOTH LINE CONTOURED HORIZONTAL ORIENTATION		
COLOR	LIGHT TAN		
TEXTURE	SMOOTH		

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

DEGREE OF CONTRAST	FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			X				X					X
Line		X					X					X
Color		X					X					X
Texture			X					X				X

2. Levels of Change: ☐ Very Low, ☐ Low, ☒ Moderate, ☐ High

3. Does project design meet visual resource management objectives? ☒ Yes ☐ No
Explain: (Continue on reverse, if necessary)
(SEE BELOW)

4. Additional mitigating measures recommended
☐ Yes ☒ No (Use reverse side if "yes".)

#3. (continued)

BLM MANUAL Rel. 8-30
1/17/86

Multiple-Use Class M (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of uses. A parallel can be drawn between multiple-use classes used for the CDCA and VRM classes used for other BLM managed lands. Objectives are similar between Multiple-Use Class M and VRM Class III. VRM Class III areas have a "low visual sensitivity" resource value. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should not be more than moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominate natural features of the characteristic landscape (BLM, 1984).

H-8431-1 - VISUAL RESOURCE CONTRAST RATING

Visual Contrast Rating Worksheet

Form 8400-4
(September 1985)

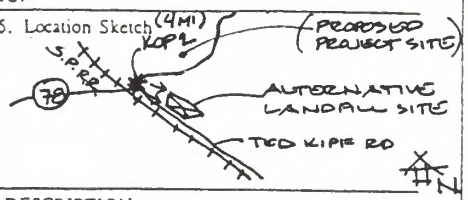
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date: 8.26.93
District: EL CENTRO
Resource Area: CALIFORNIA DESERT CONSERVATION AREA
Activity (program): CLASS III LANDFILL

SECTION A. PROJECT INFORMATION

1. Project Name: MESQUITE REGIONAL LANDFILL/ALTERNATIVE SITE
2. Key Observation Point: (2)
3. VRM Class (VRM CLASS DOES NOT APPLY): MULTIPLE-USE CLASS M
4. Location: Township 15S/14S; Range 19E; Section —
5. Location Sketch:



SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	PREDOMINANTLY FLAT, W/GRADUALLY ASCENDING SLOPES. SILHOUETTE OF CARGO MUCHACHO MNTNS VISIBLE ON HORIZON.	LOW-LYING, SIMPLE, IRREGULAR	NOT OBSERVED FROM THIS KOP.
LINE	HORIZONTALLY-ORIENTED, STRAIGHT W/ SLIGHT ANGULAR VARIATION	IRREGULAR	
COLOR	PREDOM. LIGHT TO MEDIUM TAN; AREAS OF REDDISH BRAUN	YELLOW-GREEN/ BROWN/GREEN	
TEXTURE	VARIES BETWEEN SMOOTH & MEDIUM GRAIN	SPARSE TO MEDIUM DENSITY, MEDIUM GRAIN	

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	LARGE, HORIZONTALLY-ORIENTED, HILL-LIKE FORM, WITH VERTICAL IMPACT.	NONE	WOULD BE NO MORE THAN 1 OR 2 STORIES, SOME STACKS. DUE TO DISTANCE, WOULD BE BARELY NOTICEABLE.
LINE	IRREGULAR/CONTORTED SILHOUETTE; BOLD AGAINST HORIZON		VERTICAL & HORIZONTAL - IF NOTICEABLE
COLOR	LIGHT TAN		INDUSTRIAL/TYPICALLY LOW CHROMA
TEXTURE	SMOOTH WITH DIAGONAL LINEAR PATTERN.		TYPICALLY SMOOTH; METALS, CONCRETE, ETC.

SECTION D. CONTRAST RATING ☐ SHORT TERM ☒ LONG TERM

DEGREE OF CONTRAST	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS: Form							X				X	
Line	X						X					X
Color			X			X					X	
Texture			X			X						X

2. Levels of Change: ☐ Very Low, ☐ Low, ☒ Moderate, ☐ High

3. Does project design meet visual resource management objectives? ☐ Yes ☒ No
Explain: (Continue on reverse, if necessary) (SEE BELOW)

4. Additional mitigating measures recommended: ☐ Yes ☒ No (Use reverse side if "yes".)

Rel. 8-30
1/17/86

BLM MANUAL

The proposed landform would dominate views from this KOP, resulting in a hill on an otherwise flat surface. As viewers approached the alternative site on Ted Kipf Road, the proposed landform would increasingly dominate views. The proposed landform at the alternative site would not meet VRM Class III objectives.

H-8410-1 - VISUAL RESOURCE INVENTORY

Determining Visual Resource Inventory Classes

A. Basis for Determining Visual Resource Inventory Classes

1. Class I. Class I is assigned to all special areas where the current management situations requires maintaining a natural environment essentially unaltered by man.

2. Classes II, III, and VI. These classes are assigned based on combinations of scenic quality, sensitivity levels, and distance zones as shown in the following matrix:

Visual Sensitity Levels

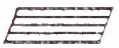
Special Areas		High			Medium			Low	
		I	I	I	I	I	I	I	*if adjacent area is
	A	II	II	II	II	II	II	II	Class III or lower
Scenic	B	II	III	III/IV*	III	IV	IV	IV	assign Class III, if
Quality	C	III	IV	IV	IV	IV	IV	IV	higher assign class IV
		f/m	b	s/s	f/m	b	s/s	s/s	

Distance Zones

B. How to Map Visual Resource Inventory Classes II, III, and IV.

Mapping inventory classes can be cumbersome and time consumming if not done in a systematic manner. Many systems have been developed to do this task. One that has been used effectively is:

Step I: Code each of the 3 overlays as follows:

Scenic Quality	A		B		C	
Sensitivity Levels	High		Moderate		Low	
Distance Zones	f/m		b		s/s	

Step 2: Copy the codes from the overlays on to a single new overlay.

Step 3: Delineate the boundaries of the inventory classes on a new overlay using the following information as a guide:

Class II - 4 or more lines (i.e., )

Class III - 3 lines (i.e. )

Class IV - 2 lines or less.

Sensitivity Level Rating Sheet

INSTRUCTIONS

Steps in the Sensitivity Level Analysis

1. Divide the inventory area into logical sensitivity rating units.

2. Analyze the factors which indicate visual sensitivity.

3. For each rating unit, rate each factor as high, moderate, or low using the following outline as a general guide:

   a. *Type of Users.* Maintenance of visual quality is:

      — a major concern for most users ..... High
      — a moderate concern for most users ..... Moderate
      — a low concern for most users ..... Low

   b. *Amount of use.* Maintenance of visual quality becomes more important as the level of use increases(see table below):

      — high level of use ..... High
      — moderate level of use ..... Moderate
      — low level of use ..... Low

   c. *Public Interest.* Maintenance of visual quality is:

      — a major public issue ..... High
      — a moderate public issue ..... Moderate
      — a minor public issue ..... Low

   d. *Adjacent Land Uses.* Maintenance of visual quality to sustain adjacent land use objectives is:

      — very important ..... High
      — moderately important ..... Moderate
      — slightly important ..... Low

   e. *Special Area.* Maintenance of visual quality to sustain Special Area management objectives is:

      — very important ..... High
      — moderately important ..... Moderate
      — slightly important ..... Low

4. Determine the over-all sensitivity level for each rating unit. This is a judgmental process which requires a careful analysis of all the above factors. Review the ratings given to each factor and analyze the relationship between factors. A high rating in any one factor does not necessarily mean that the over-all sensitivity level rating should be high. For example, the rating for "type of users" might be high but the "amount of use" might be low. Consequently, the over-all rating could be low or moderate. Management should be involved in this rating process.

5. Record the ratings and explanation on the sensitivity level rating sheet.

TABLE FOR CLASSIFYING AMOUNT OF USE

TYPE AREA	HIGH	MODERATE	LOW
Roads & Highways	Greater than 45,000 visits/yr.	5,000-45,000 visits/yr.	Lesser than 5,000 visits/yr.
Rivers & Trails	Greater than 20,000 visits/yr.	2,000-20,000 visits/yr.	Lesser than 2,000 visits/yr.
Recreation Sites	Greater than 10,000 visitor days/yr.	2,000-10,000 visitor days/yr.	Lesser than visitor 2,000 days/yr.

H-8410-1 - VISUAL RESOURCE INVENTORY

Scenic Quality - Inventory and Evaluation Chart

SCENIC QUALITY
INVENTORY AND EVALUATION CHART

key factors	rating criteria and score		
landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops; or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. 5	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. 3	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. 1
vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. 5	Some variety of vegetation, but only one or two major types. 3	Little or no variety or contrast in vegetation. 1
water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. 5	Flowing, or still, but not dominant in the landscape. 3	Absent, or present, but not noticeable. 0
color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. 5	Some intensity or variety in colors and contrast of the soil, rock, and vegetation, but not a dominant scenic element. 3	Subtle color variations, contrast, or interest; generally mute tones. 1
influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. 5	Adjacent scenery moderately enhances overall visual quality. 3	Adjacent scenery has little or no influence on overall visual quality. 0
scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. 1/ 5+	Distinctive, though somewhat similar to others within the region. 3	Interesting within its setting, but fairly common within the region. 1
cultural modifications	Modifications add favorably to visual variety while promoting visual harmony. 2	Modifications add little or no visual variety to the area, and introduce no discordant elements. 0	Modifications add variety but are very discordant and promote strong disharmony. −4

1/ A rating of greater than 5 can be given but must be supported by written justification.

INSTRUCTIONS

Purpose: To rate the visual quality of the scenic resource on all BLM managed lands.

How to Identify Scenic Value: All Bureau lands have scenic value.

How to Determine Minimum Suitability: All BLM lands are rated for scenic values. Also rate adjacent or intermingling non-BLM lands within the planning unit.

When to Evaluate Scenic Quality: Rate for scenery under the most critical conditions (i.e., highest user period or season of use, sidelight, proper atmospheric conditions, etc.).

How to Delineate Rating Areas: Consider the following factors when delineating rating areas.

1. Like physiographic characteristics (i.e., land form, vegetation, etc.).

2. Similar visual patterns, texture, color, variety, etc.

3. Areas which have a similar impact from cultural modifications (i.e., roads, historical and other structures, mining operations, or other surface disturbances).

Explanation of Criteria: (See Illustration 1)

NOTE: Values for each rating criteria are maximum and minimum scores only. It is also possible to assign scores within these ranges.

SCENIC QUALITY

A = 19 or more

B = 12-18

C = 11 or less

MESQUITE REGIONAL LANDFILL EIS/EIR

APPENDIX H

SOCIOECONOMICS

JANUARY 1994

APPENDIX H

SOCIOECONOMICS

for the proposed

MESQUITE REGIONAL LANDFILL

IMPERIAL COUNTY, CALIFORNIA

SCH. No. 92051024
BLM No. CA-060-02-5440-10-B026

prepared for

BUREAU OF LAND MANAGEMENT
California Desert District
1661 S. 4th Street
El Centro, California

and

COUNTY OF IMPERIAL
Planning And Building Department
939 Main Street
El Centro, California

January 1994

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(Continued)

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SOCIOECONOMICS

1.0 INTRODUCTION

1.1 Project Description

Gold Fields Mining Company (Gold Fields), Western Waste Industries, and SP Environmental Systems have formed a partnership to develop the proposed Mesquite Regional, Class III landfill in Imperial County. Arid Operations Inc., a wholly-owned subsidiary of Gold Fields, is the applicant for the proposed landfill and would operate the landfill for the partnership. Gold Fields presently operates the Mesquite Gold Mine at the same location. The Mesquite Regional Landfill is proposed for the long-term disposal of municipal solid waste (MSW) from the populated (e.g., Los Angeles County) portions of southern California. The material disposed would be the residue after recyclables have been removed in the area of the MSW origin. The resulting MSW residue would be nonhazardous solids delivered to the site by a rail-haul system. The landfill is expected to have sufficient volume for disposal of about 600 million tons of MSW residue during an approximate 100-year period.

1.2 Assumptions and Assessment Guidelines

Socioeconomic impacts derive primarily from changes in the existing makeup of a community. Impacts such as a change in the age, ethnicity, or income distribution of an area may affect the community either negatively or positively. For the purposes of this EIS/EIR an adverse significant socioeconomic impact is defined as follows:

- A one percent decrease in employment with the County.
- A one percent decrease in the wage and salary earnings in the County.
- A one percent decrease in the average wage and salary earnings per job in the County.
- An increase in the County's expenditure to revenue ratio.

The following assumptions have been used in completing this socioeconomic analysis:

- At least 50 percent of the labor necessary to construct and operate the proposed landfill would be hired from the local labor force. It has been demonstrated at the Mesquite Gold Mine that Imperial County workers can provide a reliable workforce for projects in this area.
- Inmigrating workers would have demographic characteristics similar to demographic characteristics for the State of California.
- Arid Operations, Inc. would pay workers a wage that is comparable to the average wages paid at the Mesquite Gold Mine for comparable work. At this time, the expected average wage for full-time landfill workers would be approximately $30,000 per year (in first quarter 1992 dollars).

- Arid Operations, Inc. would pay a "host fee" to the County of Imperial. The host fee would be based on fees negotiated with the County. A portion of the host fee may be allocated to the cities of Imperial County.

- Project-related employees and Arid Operations, Inc. would pay all applicable currently-mandated fees and taxes and the level of Intergovernmental Transfers (e.g., County share of sales tax revenues) would not be adversely affected by this project.

- The proposed project would create indirect/induced jobs.

- A regionalized Input/Output Model of the economy of the United States (Imperial County Model) will reasonably predict the indirect/induced employment effects of the proposed project.

- 1.29 indirect induced jobs would employ one unemployed person(1.29 is the average number of jobs per worker in Imperial County). Of these, 91.5 percent would be enlisting Imperial County residents and 8.5 percent would be from neighboring areas.

- Indirect employment and income effects likely are understated because the following inputs have not been included in the analysis:

  - Workers that move to Imperial County;
  - Employee benefits;
  - Property income.

- On average, persons who fill indirect/induced jobs created by the proposed project would be paid the average wage for Imperial County for nonagricultural jobs (i.e., $23,011.59 in 1992 dollars).

- Historical monetary values are in then-year dollars, current and future dollar values are in 1992 dollars.

2.0 SCOPE

The scope of the socioeconomics discussion presented here and in Chapter 5 is based on public and interested agency input from the following:

- Public testimony at the El Centro and Indio Public Scoping Meetings (Appendix A-1 of this EIS/EIR); and

- Responses to the Notice of Preparation and Notice of Intent (Appendix A-2 of this EIS/EIR);

- The professional experience of BLM and County of Imperial staff and Consultants.

The socioeconomic discussion contained in this EIS/EIR is limited to employment, income, and demographic effects within Imperial County because the majority of project-related effects would occur in Imperial County.

The issue of socioeconomic effects outside of Imperial County was raised at the Indio Public Scoping Meeting (May 28, 1992). The proposed landfill is an alternative disposal site for MSW generated in urbanized and urbanizing areas of the Los Angeles Basin.

3.0 METHODOLOGY

The purpose of the economic base analysis was to evaluate the beneficial and adverse effects of the Proposed Project on the local economy and particular economic sectors. Project data used as inputs to the analysis were derived from preliminary development plans. Therefore, the numerical results reported in this technical report should be considered order-of-magnitude estimates.

The method employed consisted of two principal components: (1) estimated direct effects on employment and income, and (2) projecting secondary changes in employment and income. These components and the results of each are discussed in the following:

3.1 Direct Economic Impacts

This section describes the data, calculations, and assumptions used to project the direct economic effects of construction and operation of the proposed Mesquite Regional Landfill on Imperial County. These direct effects are the following:

- Employment of landfill workers;
- Payrolls earned by these employees;
- Personal consumption expenditures by direct employees; and
- Regional purchases by Arid Operations, Inc. and its contractors for construction and operating supplies.

Each of these direct effects represents an important component of the total economic impact of the proposed project on Imperial County. Project-related jobs would create demands for local labor, as well as incentives for nonresidents to relocate to the region. Payrolls would add directly to the area's income base, increasing personal economic well-being, expanding purchasing power, and generating local tax revenues. Spending by direct employees and their families would expand regional sales and create secondary (indirect and induced) jobs in the region. Purchases in the region by Arid Operations, Inc., and contractors would create additional demands for locally sold goods and services.

3.1.1 Direct Project Employment

Three phases of the project were considered in this analysis: (1) Initial Construction, includes the year prior to landfill operations and the first year of landfilling; (2) Build Up, includes the second through seventh year of landfill operations, the period before maximum anticipated daily

average volume of 20,000 tons per day are received; and (3) Long Term Operations, includes the period when the landfill would operate at 20,000 tons per day (eighth through 100th years).

Initial Construction

Initial construction would begin one year prior to the acceptance of MSW at the proposed landfill and includes the first year of operation. Projected manpower requirements for construction were derived from forecasts of labor hours, developed by ESI. Forecasts were based on records of experience in constructing landfills in other locations. Operations personnel were similarly derived from forecasts of labor hours developed by ESI. These estimates are presented in Table 1.

Build Up

Direct operations employment would grow during project build-up. The additional employees would handle the gradually increasing volumes of MSW and would also complete facilities construction.

Long Term Operations

Long-term employment would stabilize starting in year eight of operations.

3.1.2 Project-Related Payrolls

Annual payrolls created by the project were provided by ESI. Estimates of yearly direct wages and benefits paid to operations employees are presented on Table 2. Only wages are considered in this analysis. Benefits that would accrue to project-related employees would be paid to undetermined insurance carriers, retirement funds, and other agents. Because it is not possible at this time to estimate the amount of these funds that would remain in the local economy, employee benefits are not included as inputs to this analysis.

Construction

Construction Expenditures for the proposed project were estimated by ESI and are presented in Table 3.

3.1.3 Personal Consumption Expenditures

Earnings by project personnel represent a source of demand for local goods and services, as these earnings are spent in the local economy for housing, food, transportation, clothing, and the many consumer goods purchased for everyday living. Not all earnings, however, would be spent locally. The share that is taxed, saved, withheld for retirement, and otherwise spent outside local economic channels would be substantial, and would vary with the level of income, and other factors. These various types of "leakages" from the local spending stream were estimated from current laws and regulations governing income and payroll taxation, and published data on consumer saving behavior.

TABLE 1

Estimated Direct Operations and Construction Employment
Proposed Mesquite Regional Landfill

	Year								
	Initial Construction			Build-Up				Long-term Operations	
	-1	1	2	3	4	5	6	7	8+
Estimated Direct Operations Employment	-	86	138	183	183	183	183	211	268
Estimated Direct Construction Employment	150	38	0	40	0	0	0	46	0

Note: Year -1 is year construction begins; Year 1 is start of operations.
Source: Environmental Solutions, Inc., 1992.

TABLE 2

Estimates of Yearly Direct Wages and Benefits Paid to Operations Personnel
Initial Construction, Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Out					Long-term Operations
	-1	1	2	3	4	5	6	7	8+
Payroll		$2.5	$4.1	$5.6	$5.6	$5.6	$5.6	$6.6	$8.0
Benefits		$2.2	$3.7	$4.9	$4.9	$4.9	$4.9	$5.9	$7.1
TOTAL		$4.7	$7.8	$10.5	$10.5	$10.5	$10.5	$12.5	$15.1

Source: Environmental Solutions, Inc., 1992.

TABLE 3

Estimates of Yearly Construction Expenditures
Initial Construction, Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Out					Long-term Operations
	-1	1	2	3	4	5	6	7	8+
Construction Expenditures	37.9	9.6	--	10.0	--	--	--	11.5	--

Note: Year -1 is year construction begins; Year 1 is start of operations. Additional expenditures for construction could occur after year 8 for facilities such as turbine/boiler generator, landfill gas cleaning plant and liquefied methane gas plant. These expenditures are not included in this analysis.

Source: Environmental Solutions, Inc., 1992.

Federal Income Taxes

The share of earnings paid by individuals in federal income taxes would vary with family income. Assuming direct project earnings would be the principal source of household income, the annual earnings figures discussed above were the basis for estimating the share of income likely to be paid in federal income taxes for each income level. Total earnings of employees were assumed to be subject to income taxation.

Table 4 contains the weighted average federal income tax rates used in this analysis. These were computed in the following manner:

- Tax withholding amounts were looked up in the employer's withholding guide for each income level of program employees. These earnings levels varied by job type. Earnings were expressed on a monthly basis for estimating tax obligations.

- Withholding amounts were pulled form the tables for single persons (one exemption), married persons (three and four exemptions), and head of household. Household sizes in Imperial County were used to determine the number of exemptions for married personnel and heads of households.

- Average tax rates were computed for single, married, and head of household workers by dividing the tax withheld by monthly earnings.

- Weighted averages of single, married, and head of household workers were calculated using the percentage distribution between single, married, and a head of household workers. These were then adjusted to a basis of total income, rather than simply taxable income.

State Income Taxes

State income tax rates were calculated in a manner similar to that described for Federal Income Tax (Table 4).

Other Taxes

All workers were assumed to contribute 6.25 percent of their gross earning to Social Security, 1.45 percent to Medicare, and 1.25 percent to California Disability.

Savings

All program employees were assumed to save 5.4 percent of their gross incomes. This is the 1980 to 1985 average U.S. savings rate from personal income (Council of Economic Advisors, 1986).

TABLE 4

Estimates of State and Local Taxes Paid by Project-Related Personnel
Proposed Mesquite Regional Landfill

	Percent of Workforce[1]	Exemptions [1]	Federal Tax Rate[2]	State Tax Rate[3]	Social Security[2]	Medicare[2]	State Disability[3]	Total
Single	0.208	1	14.77%	3.74%	6.25%	1.45%	1.25%	27.46%
Head of Household	0.194	3.73	9.49%	0.97%	6.25%	1.45%	1.25%	19.41%
Married	0.598	3.73	7.71%	0.97%	6.25%	1.45%	1.25%	17.63%
Weighted Average			9.52%	1.55%	6.25%	1.45%	1.25%	20.02%

Notes: (1) Derived from 1990 U.S. Census of Population and Housing, Imperial County, Table 5. Exemptions for head of household and married categories derived from persons per household data.
(2) Federal tax rates were derived from the U.S. Internal Revenue, Circular E, Employer's Tax Guide (Revised Feb. 1992).
(3) State tax rates were derived from California Employment Development Department, California Personnel Income Tax Withholding Guide (January 1, 1992).

Source: The Butler Roach Group, 1992.

Other Nonlocal Expenditures

This category would include purchases of goods and services in other areas (e.g., money spent on vacations away from Imperial County). For Imperial County, this is estimated to be 6.5 percent by the input-output model (Imperial County model described later) including the household sector.

3.1.4 Regional Purchases

Arid Operations, Inc. and associated contractors would likely purchase measurable volumes of goods and services in the region during both the construction and operations phases of the project:

- Construction materials and services, and
- Operations support items, such as maintenance and repair services needed to operate the landfill on a continuing basis.

Each of these types of purchases is discussed below.

Construction Materials and Services

ESI projected the requirements for construction materials and services for the proposed project (Table 5). Requirements were projected on a quantity basis in FY 1992 dollars.

In order to analyze the secondary economic impacts of these expenditures, these commodity demands must be assigned to industrial sectors. The correspondence among commodities and the sectors of the Imperial County Model used in this analysis are shown in Table 6. Table 7 presents the estimated project-related spending by industrial sector.

Not all of these needed goods and services likely would be purchased in Imperial County. A regional purchase coefficient was developed for the input-output sector and its corresponding commodities for Imperial County. These purchase coefficients, calculated as location quotients, are shown in Table 8. Regional demands were then estimated from the projected requirements by multiplying the regional purchase coefficient by the total scenario requirements for that commodity. Individual commodities were aggregated to input-output sectors. The results of these computations were regional purchase estimates (Table 9).

Operations Procurement

Local purchases of goods and services needed to operate the landfill represented another source of final demand in this analysis (Table 5). Many of the goods and services used would be purchased elsewhere, and would have no traceable impact on the region. A portion of operations procurement would result in purchases from local sources.

Local purchases were also calculated by applying the sector-specific regional purchase coefficient to the estimated project requirements (Table 9).

TABLE 5

Estimated Project-Related Spending by Commodity Demand
Initial Construction Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
Land/Legal/PR	$3.4						$16.2	$23.1	
Emission Offsets	$2.2								
Permit/Engineer/Const	$8.9	$0.6		$0.8				$1.0	
Property Improvement	$27.3	$9.6		$10.0				$10.8	
Building/Structures	$10.6							$0.7	
Mobile Equipment	$14.2	$3.1						$10.5	
Payroll+Benefits		$4.7	$7.8	$10.5	$10.5	$10.5	$10.5	$12.5	$15.1
Equipment Operation		$1.1	$2.2	$3.2	$3.2	$3.2	$3.2	$4.3	$5.4
Facilities Operation		$0.6	$0.9	$1.2	$1.2	$1.2	$1.2	$1.3	$1.5
Yearly Construction		$0.6	$0.7	$1.0	$1.0	$1.0	$1.0	$1.0	$1.0
Taxes		$0.5	$0.6	$0.7	$0.7	$0.7	$0.7	$0.9	$1.0
Insurance		$0.4	$0.5	$0.7	$0.7	$0.7	$0.7	$0.9	$1.1
Other		$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2
TOTAL	$66.6	$21.4	$12.9	$28.3	$17.5	$17.5	$33.7	$67.2	$25.3

Source: Environmental Solutions, Inc., 1992.

TABLE 6

Correspondence Between Commodity Demands and Industrial Sectors
Proposed Mesquite Regional Landfill

Commodity Demand Sector	Industrial Sectors
Land, Legal, and Public Relations	Real Estate
Emission Offset	---
Permitting, Engineering, Construction	Services and Other
Property Improvement	Rest of Construction
Building Structures	New Industrial Buildings
Mobile Equipment	Manufacturing
Payroll and Benefits	Personal Consumption Expenditures
Equipment Operation	Manufacturing
Facilities Operation	50% Utilities 50% Rest of Transportation, Communication, and Public Utilities (TCPU)
Yearly Construction	Construction
Taxes	---
Insurance	Rest of Finance, Insurance, and Real Estate (FIRE)
Other	Services and Other

--- = Not included in this analysis.

Source: The Butler Roach Group, Inc., 1992.

TABLE 7

Estimated Project-Related Spending by Industrial Sector
Initial Construction, Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
New Industrial Buildings	$10.6	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.7	$0.0
Rest of Construction	$27.3	$10.2	$0.7	$11.0	$1.0	$1.0	$1.0	$11.8	$1.0
Manufacturing	$14.2	$4.2	$2.2	$3.2	$3.2	$3.2	$3.2	$14.8	$5.4
Utilities	$0.0	$0.3	$0.5	$0.6	$0.6	$0.6	$0.6	$0.7	$0.8
Rest of TCPU	$0.0	$0.3	$0.5	$0.6	$0.6	$0.6	$0.6	$0.7	$0.8
Real Estate	$3.4	$0.0	$0.0	$0.0	$0.0	$0.0	$16.2	$23.1	$0.0
Rest of FIRE	$0.0	$0.4	$0.5	$0.7	$0.7	$0.7	$0.7	$0.9	$1.1
Services and Other	$8.9	$0.8	$0.2	$1.0	$0.2	$0.2	$0.2	$1.2	$0.2
Pers Consumption Exp.	$0.0	$4.7	$7.8	$10.5	$10.5	$10.5	$10.5	$12.5	$15.1
TOTAL	$64.4	$20.9	$12.3	$27.6	$16.8	$16.8	$33.0	$66.3	$24.3

Source: The Butler Roach Group, Inc., 1992.

TABLE 8

Regional Purchase Coefficients (RPC)
Imperial County California
Proposed Mesquite Regional Landfill

Industrial Sector	RPC
New Industrial Buildings	0.885
Rest of Construction	0.885
Manufacturing	0.050
Utilities	1.000
Rest of TCPU	0.667
Real Estate	0.000
Rest of FIRE	0.041
Services and Other	1.000
Personal Consumption Expenditures	0.180

Note: RPC = LQ(j)=(RS(j)/TRS)/(NS(j)/TNS)

where

LQ(j) = location quotient for industry j
RS(j) = regional sales for industry j
TRS = total regional sales
NS(j) = national sales for industry j
TNS = total national sales

Manufacturing: The majority of spending within this sector would be for heavy equipment that is not manufactured within Imperial County.

Real Estate: The majority of land purchases will occur in Riverside County, the location of the proposed BLM exchange parcels.

Personal Consumption Expenditures: The following "leakages" were assumed from project payrolls and benefits: 50% out of County Employees, 47% benefits, 20.02% taxes, 5.4 percent savings, and 6.5 percent out of County spending by County residents.

Source: The Butler Roach Group, Inc., 1992.

TABLE 9

Estimated Project-Related Spending
Initial Construction Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
New Industrial Buildings	$9.381	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.620	$0.000
Rest of Construction	$24.161	$9.027	$0.620	$9.735	$0.885	$0.885	$0.885	$10.443	$0.885
Manufacturing	$0.710	$0.210	$0.110	$0.160	$0.160	$0.160	$0.160	$0.740	$0.270
Utilities	$0.000	$0.300	$0.450	$0.600	$0.600	$0.600	$0.600	$0.650	$0.750
Rest of TCPU	$0.000	$0.200	$0.300	$0.400	$0.400	$0.400	$0.400	$0.434	$0.500
Real Estate	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Rest of FIRE	$0.000	$0.016	$0.021	$0.029	$0.029	$0.029	$0.029	$0.037	$0.045
Services and Other	$8.900	$0.800	$0.200	$1.000	$0.200	$0.200	$0.200	$1.200	$0.200
Pers Consumption Exp.	$0.000	$0.848	$1.407	$1.894	$1.894	$1.894	$1.894	$2.255	$2.724
TOTAL	$43.152	$11.401	$3.107	$13.818	$4.168	$4.168	$4.168	$16.378	$5.375

Source: The Butler Roach Group, Inc., 1992.

3.2 Secondary Economic Impacts

The direct economic effects previously discussed were used as inputs in estimating indirect and induced changes in the region. Spending of worker earnings and materials expenditures by Arid Operations, Inc. and contractors in the region would have "multiplier" effects on local sales, income, and jobs.

These changes were estimated using a regional interindustry model of Imperial County (Imperial County Model). The principal steps involved in the analysis were the following:

- Development of detailed regional interindustry data. This data base starts with national technical coefficients developed from the U.S. input-output tables. Regional coefficients were then prepared, with the 1984 County Business Patterns (CBP, 1984) as the principal data source, and the Census of Agriculture as the data source for agricultural sectors (U.S. Bureau of the Census,1984);

- Formulation of a sectoring plan most suitable for the analysis. The detailed industrial data were aggregated consistent with this plan, and multipliers were calculated using the Leontief inverse of the input-output model. Households were included in the local model, capturing the induced effects of local consumer spending;

- Multiplication of county-level demand changes previously discussed times the vector of multipliers associated with those changes. The result was a year-by-year forecast of indirect and induced county sales (output) changes resulting form the program; and

- Estimation of employment changes by sector, and added together to derive a total job change attributable to these indirect and induced sales changes. This was done by multiplying the sales changes times sector-specific ratios of employment to sales.

Each of these components of the analysis is discussed below.

3.2.1 Regional Interindustry Data Base

The starting point in developing the detailed regional interindustry data base was the U.S. input-output study (U.S. Bureau of Economic Analysis 1984). Use and make tables, showing the composition of production and purchases by 537 industries, have been developed for a 1977 base year by the U.S. Bureau of Economic Analysis. These tables were combined into a single transactions table, and the data were transformed to create a table of national technical coefficients. These coefficients reflected the technology involved in producing the output of each economic sector.

This technology base was used as an input to the model. The next step was to estimate regional coefficients taking into account both technological requirements and regional and state trade patterns. Industries located in a particular region may purchase most of their needed materials locally, or they may import them from outside the region. The capacity of a region's industrial

base to supply goods and services needed by other industries in the region is a major determinant of this trade pattern.

To account for regional supply capabilities LQs were estimated from industrial data for the County of Imperial. The basic form of these LQs is the following:

$$LQ(j)=(RS(j)/TRS)/(NS(j)/TNS)$$

where

LQ(j)	=	location quotient for industry j
RS(j)	=	regional sales for industry j
TRS	=	total regional sales
NS(j)	=	national sales for industry j
TNS	=	total national sales

The LQ is a measure of the relative degree of concentration of the region's economy in a particular industry. As a rule, if a region produces as much as, or more of, its sales from a particular sector as the nation as a whole, the region is likely to be self-sufficient, or an exporter, in that industry. If the region produces less, it is probably an importer of the products sold by that industry. This means that LQs of one or greater indicate self-sufficiency, while LQs less than one imply at least partial import status for that sector.

These LQs were used to estimate the effect of regional trade on industry demands. Each technical coefficient developed from the nationwide data base was multiplied by its corresponding LQ (or by one if the LQ is greater than one) to separate total requirements for that industry from the industry's demands which would be met from within the region or state. This "scaling" reduced the regional coefficients from their national counterparts, in some cases to zero, if particular sectors were absent from the local economy.

The County Business Patterns (CBP) is the principal data base used to develop these LQs. Employment and payrolls data were available by four-digit Standard Industrial Classification for every U.S. county from this source, though some data were suppressed to avoid disclosing confidential business information. Missing data were estimated using the full extent to known information, and payrolls values were used to approximate regional sales in the above formula.

Agricultural sectors were not covered by the CBP data base. Data on sales of agricultural products in California were obtained form the Census of Agriculture (U.S. Bureau of the Census 1984). Some of the agricultural data also contained missing values. These were approximately using the share of farms in each category, assuming equal sales per farm in the suppressed-data categories. These data, along with information on the share of farm earnings in total regional earnings (U.S. Bureau of Economic Analysis 1986), were used to estimate LQs for the agricultural sectors in the region and state.

Finally, the effect of taxes on personal income was used to scale down regional consumption spending to account for tax "leakages" from the region. The State of California ratio of disposable personal income to personal income (U.S. Bureau of Economic Analysis 1986) was used to estimate this relationship.

3.2.2 Sectoring Plan

The detailed industry data base previously discussed provided information for up to 530 sectors at the national level. This amount of detail was useful because it accurately separated industries within the County from those outside. Imperial County does not have all 530 sectors in its economy. Table 10 presents the sectors that were identified by the County Business Patterns as existing in Imperial County. However, for analysis of indirect and induced sales and employment, the number of sectors in Imperial County are quite unwieldy. Consequently, it was necessary to aggregate many of these sectors together to simplify the analysis. This was done after the detailed industry data for the County were used to estimate the effects of regional trade on the technical coefficients.

The materials purchases projected for the proposed landfill, as specified above, formed the basis for developing this sectoring plan. Sectors where final demand changes were anticipated were left disaggregated in the regional model. Other sectors that would be indirectly, but not directly, impacted by regional purchases were grouped together. For example, construction of industrial buildings was left as a separate sector, but all other construction was included in an "other construction" category.

The aggregated matrix was derived by adding together the row elements in sectors being combined, while calculating weighted averages of column elements in these sectors. The weights used in this averaging were estimated output in each detailed sector. This gave more importance to the larger sectors and less importance to the smaller ones. Estimated output was calculated from payrolls data for that sector (from the CBP, as previously discussed) times the national average ratio of output to payrolls in that sector. A total of 16 sectors, including households, was specified. This general sectoring plan appears in Table 11.

The matrix of regional multipliers was then calculated from the regional and state technical coefficients matrices at this more aggregated level. With households included in each matrix, the "Leontief inverse" matrix represented the total (direct, indirect, and induced) sales required to deliver one dollar of additional sales to final demand. For example, the purchase of $10 million worth of cement may require a total change in regional sales of $25 million, with the extra $15 million going to other sectors that sell inputs to the cement sector or sell consumer goods to people in the various sectors of the economy who derive income directly or indirectly from the project. The matrix of multipliers (or Leontief inverse matrix) showed the magnitude and distribution of these sales changes among the various sectors of the economy (Table 12).

3.2.3 Multiplier Analysis

To determine the impact of a demand change in a particular sector in a particular year (e.g., new industrial buildings in year 1) the change is multiplied by the multipliers associated with that sector. The result is the amount of sales required from each sector to meet the projected final sales in the new industrial buildings sector. The sum of these sales changes represents the total (direct, indirect, and induced) sales change in the region resulting from an initial change in final demand. The induced or consumer-spending effects of these changes in final demand are also

TABLE 10

Imperial County Economic Sectors
Proposed Mesquite Regional Landfill

RIMS No.	Industry Name
2	Poultry and Eggs
3	Meal Animals
7	Feed Grains
8	Grass Seeds
20	Agricultural, Forestry and Fishery Services
21	Landscape and Horticultural Services
24	Nonferrous Metal Ores Mining, Except Copper
26	Crude Petroleum and Natural Gas
32	New Residential One-Unit Structures, Nonfarm
33	New Residential Two-Four Unit Structures, Nonfarm
34	New Residential Garden Apartments
35	New Residential High Rise Apartments
36	New Residential Additions and Alteration, Nonfarm
37	New Hotels and Motels
38	New Dormitories
39	New Industrial Buildings
40	New Office Buildings
41	New Warehouses
42	New Garages and Service Stations
43	New Stores and Restaurants
44	New Religious Buildings
45	New Educational Buildings
46	New Hospitals
47	New Residential Institutions and Other Health Related Fields
48	New Amusement and Recreation Buildings
49	Other New Nonfarm Buildings
50	New Telephone and Telegraph Facilities
51	New Railroads
52	New Electric Utility Facilities
53	New Gas Utility Facilities
54	New Petroleum Pipelines
55	New Water Supply Facilities
56	New Sewer System Facilities
57	New Local Transit Facilities
58	New Highways and Streets
59	New Farm Housing Units and Additions and Alterations

Source: County Business Patterns, 1984.

TABLE 10 (Continued)

RIMS No.	Industry Name
60	New Farm Service Facilities
61	New Petroleum and Natural Gas Well Drilling
62	New Petroleum, Natural Gas, and Solid Mineral Exploration
63	New Access Structures for Solid Mineral Development
64	New Military Facilities
65	New Dams and Reservoirs
66	New Conservation and Development Facilities
67	Other New Nonbuilding Facilities
68	Maintenance and Repair, Residential
69	Maintenance and Repair of Other Nonfarm Buildings
70	Maintenance and Repair of Farm Residential Buildings
71	Maintenance and Repair of Farm Service Facilities
72	Maintenance and Repair of Telephone and Telegraph Facilities
73	Maintenance and Repair of Railroads
74	Maintenance and Repair of Electric Utility Facilities
75	Maintenance and Repair of Gas Utility Facilities
76	Maintenance and Repair of Petroleum Pipelines
77	Maintenance and Repair of Water Supply Facilities
78	Maintenance and Repair of Sewer Facilities
79	Maintenance and Repair of Local Transit Facilities
80	Maintenance and Repair of Military Facilities
81	Maintenance and Repair of Conservation and Development Facilities
82	Maintenance and Repair of Highways and Streets
83	Maintenance and Repair of Petroleum and Natural Gas Wells
84	Maintenance and Repair of Other Nonbuilding Facilities
91	Meal Packing Plants
112	Prepared Feeds, N.E.C.
117	Sugar
127	Cottonseed Oil Mills
133	Manufactured Ice
135	Food Preparations, N.E.C.
160	Apparel Made from Purchased Materials
161	Curtains and Draperies
170	Sawmills and Planing Mills, General
208	Paperboard Containers and Boxes
209	Newspapers
214	Commercial Printing
226	Fertilizers, Mixing Only
253	Miscellaneous Plastic Products

Source: County Business Patterns, 1984.

TABLE 10 (Continued)

RIMS No.	Industry Name
277	Concrete Products, N.E.C.
278	Ready-Mixed Concrete
280	Gypsum Products
320	Sheet Metal Work
341	Farm Machinery and Equipment
370	Machinery, Except Electrical, N.E.C.
377	Refrigeration and Heating Equipment
379	Service Industry Machines, N.E.C.
429	Surgical Appliances and Supplies
453	Signs and Advertising Displays
455	Railroads and Related Services
456	Local, Suburban, and Interurban Highway Passenger Trans.
457	Motor Freight Transportation and Warehousing
459	Air Transportation Services
460	Pipelines, Except Natural Gas
461	Freight Forwarders and Other Transportation Services
462	Arrangement of Passenger Transportation
463	Communications, Except Radio and TV
464	Radio and TV Broadcasting
466	Gas Production and Distribution (Utilities)
467	Water Supply and Sewerage Systems
468	Sanitary Services, Steam Supply, and Irrigation Systems
469	Wholesale Trade
470	Retail Trade
471	Banking
472	Credit Agencies
473	Security and Commodity Brokers
474	Insurance Carriers
475	Insurance Agents and Brokers
476	Owner Occupied Dwellings
477	Real Estate
478	Hotels and Lodging Places
479	Laundry, Cleaning, Garment Services, and Shoe Repair
480	Funeral Service and Crematories
481	Portrait, Photographic Studios, and Other Misc. Personal
482	Electrical Repair Shops
483	Watch, Clock, Jewelry, and Furniture Repair Shops
484	Beauty and Barber Shops
485	Miscellaneous Repair Shops
486	Services to Dwelling and Other Buildings

Source: County Business Patterns, 1984.

TABLE 10 (Continued)

RIMS No.	Industry Name
487	Personnel Supply Services
488	Computer and Data Processing Services
489	Management and Consulting Services, Testing and Research
490	Detective and Protective Services
491	Equipment Rental and Leasing Services
493	Other Business Services
494	Advertising
495	Legal Services
496	Engineering, Architectural, and Surveying Services
497	Accounting, Auditing and Bookkeeping, and Misc. Services
498	Eating and Drinking Places
499	Automotive Rental and Leasing, Without Drivers
500	Automotive Repair Shops and Services
501	Automobile Parking and Car Washes
502	Motion Pictures
504	Bowling Alleys, Billiard and Pool Establishments
507	Membership Sports and Recreation Clubs
508	Other Amusement and Recreation Services
509	Doctors and Dentists
510	Hospitals
511	Nursing and Personal Care Facilities
512	Other Medical and Health Services, Excluding Nursing Homes
513	Elementary and Secondary Schools
514	Colleges, Universities, and Professional Schools
515	Libraries, Correspondence and Vocational Schools and Edu.
516	Business Associations and Professional Membership Organizations
517	Labor Organizations and Civic, Social and Fraternal Assoc.
518	Religious Organizations
519	Other Membership Organizations
520	Job Training and Related Services
521	Child Day Care Services
522	Residential Care
523	Social Services, N.E.C.
524	U.S. Postal Service
526	Commodity Credit Corporation
528	Local Government Passenger Transit
538	Personal Consumption Expenditures

Source: County Business Patterns, 1984.

TABLE 11

Imperial County Model Sectoring Plan
Proposed Mesquite Regional Landfill

1)	Sector	1 of Aggregated Matrix: Included Detail Sectors:	Agriculture, Forestry and Fisheries 1-21
2)	Sector	2 of Aggregated Matrix: Included Detail Sectors:	Mining 22-31
3)	Sector	3 of Aggregated Matrix: Included Detail Sectors:	11.0201 New Industrial Buildings 39
4)	Sector	4 of Aggregated Matrix: Included Detail Sectors:	11.0701 New Military Facilities 64
5)	Sector	5 of Aggregated Matrix: Included Detail Sectors:	12.0212 Maint. and Rep. of Military Facilities 80
6)	Sector	6 of Aggregated Matrix: Included Detail Sectors:	Rest of Construction 32-38, 40-63, 65-79, 81-84
7)	Sector	7 of Aggregated Matrix: Included Detail Sectors:	Manufacturing 85-454
8)	Sector	8 of Aggregated Matrix: Included Detail Sectors:	65.0300 Freight Transport and Warehousing 457
9)	Sector	9 of Aggregated Matrix: Included Detail Sectors:	Utilities 465-468
10)	Sector	10 of Aggregated Matrix: Included Detail Sectors:	Rest of Transport., Communications, Utilities 455, 456, 458-464

Source: The Butler Roach Group, 1992.

TABLE 11 (Continued)

Imperial County Model Sectoring Plan
Proposed Mesquite Regional Landfill

11)	Sector	11 of Aggregated Matrix: Included Detail Sectors:	69.0100 Wholesale Trade 469
12)	Sector	12 of Aggregated Matrix: Included Detail Sectors:	69.0200 Retail Trade 470
13)	Sector	13 of Aggregated Matrix: Included Detail Sectors:	71.0200 Real Estate 477
14)	Sector	14 of Aggregated Matrix: Included Detail Sectors:	Rest of Finance, Insurance, Real Estate 471-476
15)	Sector	15 of Aggregated Matrix: Included Detail Sectors:	Services and Other 478-537
16)	Sector	1 of Aggregated Matrix: Included Detail Sectors:	91.0000 Personal Consumption Expenditures 538

Source: The Butler Roach Group, 1992.

TABLE 12

Regionalized Multipliers
Imperial County, California
Proposed Mesquite Regional Landfill

	Agricultural Facility and Fisheries	Mining	Construc-tion	Manu-facturing	TCPU	Trade	FIRE	Services	Household
New Industrial Buildings	0.0069	0.0004	1.0058	0.044	0.0425	0.1247	0.0492	0.124	0.3122
Rest of Construction	0.0148	0.0006	1.0076	0.0978	0.0605	0.1785	0.0701	0.4151	0.4649
Manufacturing	0.1372	0.0015	0.0125	1.1658	0.1015	0.1247	0.0508	0.0799	0.3022
Utilities	0.0021	0.0495	0.0263	0.0113	1.5336	0.0423	0.0377	0.0464	0.2001
Rest of TCPU	0.0047	0.0011	0.0504	0.0239	1.0601	0.1017	0.0795	0.1153	0.4846
Real Estate	0.0036	0.0005	0.0516	0.0131	0.025	0.026	1.0636	0.0397	0.0993
Rest of FIRE	0.0058	0.0004	0.0379	0.0229	0.0413	0.0749	1.0949	0.112	0.3911
Services and Other	0.0105	0.0007	0.015	0.0444	0.0576	0.1292	0.0872	1.1285	0.0541
Pers Consumption Exp.	0.0084	0.0008	0.010	0.037	0.0599	0.1991	0.1597	0.1703	1.2069

Source: Imperial County Model Output, run dated August 1, 1992, Revised August 17, 1993.

included since households are part of the multiplier matrix. This procedure was performed for all project-related final-demand changes. Estimates of yearly project-related changes in final demand are presented in Table 13.

3.2.4 Employment Estimates

The changes in industry sales related to the proposed project formed the basis for estimating employment changes. Each industry sales change was multiplied by an employment-output ratio. The result was an estimate of indirect and induced employment in that industry. These job changes were aggregated to major industry groups as follows: (1) agriculture, forestry, and fisheries; (2) mining; (3) construction; (4) manufacturing; (5) transportation and communication; (6) trade; (7) finance, insurance and real estate; and (8) services and other. Total job impacts in all sectors were also estimated.

The employment-output ratios were estimated specifically for the sectors in the Imperial County Model. The data include output (sales) and total employment in each sector. The 16 sectors were mapped to the 530 sectors used as the industry data base for this analysis, with one of the BLS sectors assumed to have an employment-output ratio typical of one or more of the 530 sectors. The more disaggregated data were then combined to produce average employment-output ratios for the industrial sectors in the model (households were excluded because indirect and induced household output is really a measure of indirect and induced income). The ratios for each industry were derived form the 530-sector data base as weighted averages of the more detailed data. The weights used in this calculation were the estimated output values of each detailed sector in Imperial County, so that large individual sectors within an industry received more weight than small sectors in deriving the employment-output ratio for that regional industry. The employment-output ratios are presented in Table 14.

The employment-output calculations were performed for each year for Imperial County. The average number of jobs per worker for Imperial County (1.29) was applied to the estimated number of indirect jobs to determine the number of workers that would be employed as a result of project-related direct employment and the purchase of goods and services in Imperial County (Table 15).

3.3 Regional Income Effects

The creation of direct, indirect, and induced jobs in Imperial County as a result of the project would create an incentive for workers, many with their families, to relocate to take these jobs. The earnings of these workers and previously unemployed local workers, as well as profits of County businesses benefiting from the project would raise County income.

Based on the historical hiring practices of the Mesquite Mine, it is estimated that at least 50 percent of the workforce would be unemployed or underemployed locals. Other workers would commute from surrounding counties or relocate to Imperial County. Wages paid to these workers are assumed to be spent outside of Imperial County and are not included in this analysis. Because the majority of jobs at the Mesquite Mine are filled by Imperial County residents or residents of other counties that commute to work each day, project-related

TABLE 13

Estimates of Project-Related Changes in Final Demand
Initial Construction Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
Agg, For, Fish	$613,166	$179,600	$40,656	$195,750	$56,370	$56,370	$56,370	$295,519	$79,313
Mining	$25,544	$22,046	$24,416	$38,448	$32,578	$32,578	$32,578	$42,934	$40,949
Construction	$33,921,905	$9,137,306	$670,395	$9,881,967	$952,707	$952,707	$952,707	$11,235,606	$971,990
Manufacturing	$4,006,562	$1,202,083	$258,658	$1,265,131	$364,081	$364,081	$364,081	$2,067,565	$527,035
TCPU	$2,445,108	$1,337,203	$1,153,613	$2,121,875	$1,540,370	$1,540,370	$1,540,370	$2,395,414	$1,938,026
Trade	$6,720,877	$1,943,959	$481,410	$2,332,240	$649,155	$649,155	$649,155	$2,711,996	$845,852
FIRE	$2,967,344	$893,810	$354,459	$1,166,135	$475,990	$475,990	$475,990	$1,364,287	$645,677
Services	$21,292,647	$4,849,919	$789,075	$5,582,084	$1,005,649	$1,005,649	$1,005,649	$6,293,366	$1,176,101
Pers Consumption Exp.	$14,857,017	$5,490,181	$2,273,949	$7,239,737	$3,082,092	$3,082,092	$3,082,092	$8,413,242	$4,201,848
TOTAL	$86,850,169	$25,056,108	$6,046,630	$29,823,366	$8,158,991	$8,158,991	$8,158,991	$34,819,930	$10,426,792

Source: The Butler Roach Group, Inc., 1992.

TABLE 14

Employment-Output Ratios
Proposed Mesquite Regional Landfill

Sector	Employment Output Ratio
Agg, For, Fish	0.000027
Mining	0.000012
Construction	0.000011
Manufacturing	0.000014
TCPU	0.000009
Trade	0.000022
FIRE	0.000011
Services	0.000018

Note: Deflated from 1986 to 1992 dollars using the U.S. Domestic Product Deflator.

Source: Bureau of Labor Statistics, 1987.

TABLE 15

Estimated Number of Indirect/Induced Workers from Project-Related Purchases and Direct Wages in Imperial County Initial Construction Build Up, and Long-Term Operations Proposed Mesquite Regional Landfill

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
Agg, For, Fish	13	4	1	4	1	1	1	6	2
Mining	0	0	0	0	0	0	0	0	0
Construction	184	51	6	56	8	8	8	64	9
Manufacturing	43	13	3	14	4	4	4	22	6
TCPU	17	9	8	15	11	11	11	17	13
Trade	115	33	8	40	11	11	11	46	14
FIRE	24	7	3	10	4	4	4	11	5
Services	296	67	11	78	14	14	14	88	16
TOTAL	692	184	40	217	53	53	53	254	65

Source: The Butler Roach Group, Inc., 1992

relocation is expected to be small (less than 0.25 percent of the existing population of Imperial County if one-half of the workforce relocates to Imperial County and has an average household size equal to the County's 3.26 persons per household) and insignificant. Table 16 presents the estimated direct and secondary project-related employment by place of residence.

3.3.1 Regional Personal Income

Wages paid to direct workers would represent one source of County employee earnings created by the project. In addition, workers employed in indirect and induced jobs would receive earnings attributable to the program. It is estimated that the average indirect/induced employee would receive the average wage paid to non-agricultural workers in 1991, inflated to1992 dollars (i.e., $23,011.59). Profits, rents, and other property-type income received by firms and individuals as a result of indirect and induced economic activity would constitute the third principal source of regional income gains resulting from the program.

Direct employee payroll data were previously discussed. Indirect and induced employee earnings were estimated from the numbers of workers projected to be employed, times the regional average wage as developed in the baseline projections. Table 17 presents the estimated project-related earnings, from project-related payroll and in-county purchases of goods and services, of direct and indirect workers. Property-type income created by the program in the region was not estimated because it is very difficult to trace such income through the economy and to determine the local versus non-local share.

4.0 AFFECTED ENVIRONMENT

4.1 Employment

4.1.1 Existing Employment and Income in Imperial County

Employment data for Imperial County and the State of California are presented in Table 18. In 1991, the County of Imperial's civilian labor force was estimated to be 48,825 persons (EDD, 1991). Of this number, 38,450 were employed and 10,375 were unemployed. The unemployment rate was 21.3 percent. Unemployment in Imperial County was far above the state average of 7.5 percent. More recent data indicates that the County's civilian labor force had grown to approximately 53,600 persons by June of 1993 (p EDD, 1993). Of this labor force, 40,625 were employed and 12,975 were unemployed. The unemployment rate was 24.2 percent in June of 1992, an increase of 1.9 percentage points from the 1991 unemployment rate. It must be noted, however, that June 1993's unemployment rate was higher than the monthly unemployment rates for January through May of 1993. Nevertheless, the average unemployment rate for 1991 was lower than the monthly unemployment rate for any month in 1993 through June.

By 1994, the civilian labor force is expected to decline to 48,285 with employment and unemployment estimated to be 38,865 and 9,420 respectively (EDD, 1992). This will result in a decreased labor force participation rate in Imperial County.

TABLE 16

Estimated Direct Employment by Place of Residence and of Indirect/Induced Employment by Place of Residence Produced by Project-Related Purchases and Direct Wages in Imperial County Initial Construction, Build-Up, and Long-Term Operations

Proposed Mesquite Regional Landfill Project

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
Residents of Imperial County[1]									
Direct	75	62	69	112	92	92	92	129	134
Secondary	633	168	36	199	49	49	49	232	60
Subtotal	708	230	105	311	141	141	141	361	194
Residents of Other Counties[1]									
Direct	75	62	69	111	91	91	91	128	134
Secondary	56	16	4	18	4	4	4	22	5
Subtotal	131	78	73	129	95	95	95	150	139
Total									
Direct	150	124	138	223	183	183	183	257	268
Secondary	692	184	40	217	53	53	53	254	65
Total	842	308	178	540	236	236	236	511	333

Note: It is estimated that approximately 91.5 percent of indirect and induced workers would be from Imperial County, the remaining 8.5 percent would be from other counties. This estimate was derived by dividing the State-wide number of jobs per worker by the County-wide number of jobs per worker. For the State as a whole, in-state workers, who live out-of-State, make up a very small proportion of the labor force because the major employment areas of the State are located along the coastal and central portions of the State. These areas are substantially separated from neighboring states and the Federal Republic of Mexico and therefore, the vast majority of jobs in the State are held by people who have a residence in California. This same condition does not hold true in Imperial County where many workers commute from Arizona and the Federal Republic of Mexico. This methodology may result in an underestimate of the number of jobs that go to local workers because Imperial County has a large (in percentage terms) agricultural labor force as compared to the State and agricultural workers hold more jobs per year than workers in most other economic sectors. Therefore, the ratio of State-wide to County-wide jobs per worker is a reasonable lower-bound of employment of Imperial County residents.

Source: The Butler Roach Group, Inc., 1993.

TABLE 17

Estimated Direct and Indirect/Induced Project-Related Employee Earnings
By Place of Residence
From Project-Related Payrolls
and Purchases of Goods and Services in Imperial County
Initial Construction Build Up, and Long-Term Operations
Proposed Mesquite Regional Landfill
(Millions 1992$)

	Year								
	Initial Construction			Build-Up					Long-Term Operations
	-1	1	2	3	4	5	6	7	8+
Residents of Imperial County									
Direct Earnings	$1.90	$1.73	$2.05	$3.31	$2.80	$2.80	$2.80	$3.88	$4.00
Secondary Earnings	14.57	3.87	0.83	4.58	1.13	1.13	1.13	5.34	1.38
Subtotal	$16.47	$5.60	$2.88	$7.89	$3.93	$3.93	$3.93	$9.22	$5.38
Residents of Other Counties									
Direct Earnings	$1.90	$1.73	$2.05	$3.31	$2.80	$2.80	$2.80	$3.88	$4.00
Secondary Earnings	1.36	0.37	0.09	0.41	0.09	0.09	0.09	0.51	0.12
Subtotal	$3.26	$2.10	$2.14	$3.72	$2.89	$2.89	$2.89	$4.39	$4.12
Totals									
Direct Earnings	$3.80	$3.46	$4.10	$6.61	$5.60	$5.60	$5.60	$7.77	$8.00
Secondary Earnings	15.92	4.23	0.92	4.99	1.22	1.22	1.22	5.84	1.50
TOTAL	$19.72	$7.70	$5.02	$11.61	$6.82	$6.82	$6.82	$13.61	$9.50

Source: The Butler Roach Group, Inc., 1993.

TABLE 18

1991 Employment, Imperial County and the State of California
Proposed Mesquite Regional Landfill

	Imperial County		State of California	
Civilian Labor Force	48,825 (a)		14,833,000 (b)	
Employed Labor Force	38,450		13,714,000	
Unemployed Labor Force	10,375		1,119,000	
Unemployment Rate	21.3%		7.5%	
Wage and Salary Employment				
Agricultural Services, Forestry & Fishing	7,621	16.9%	305,538	1.9%
Mining	744	1.7	49,901	0.3
Construction	2,098	4.7	752,453	4.7
Manufacturing	1,708	3.8	2,099,764	13.2
Transportation & Public Utilities	1,596	3.5	684,773	4.3
Wholesale Trade	2,345	5.2	785,092	4.9
Retail Trade	8,296	18.4	2,556,118	16.0
F.I.R.E.*	1,774	3.9	1,465,134	9.2
Services	8,442	18.9	4,813,665	30.2
Government	10,362	23.0	2,443,078	15.3
Total Non-Agricultural	44,986		15,955,516	
Total	49,867		16,220,671	

Notes: Numbers may not add due to rounding. Employed labor force is measured by "place of residence." Total wage and salary employment is measured by "place of work." Therefore, employed labor force and total wage and salary employment are not the same number.

(*) F.I.R.E. = Finance, Insurance and Real Estate.

Source: (a) EDD, 1992.

(b) Ca Dept. of Finance, 1992 .

(c) U.S. BEA, 1993.

The following employment data were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information System (U.S. Bureau of Economic Analysis, 1993). The employment data present two different measures of employment; place of residence and place of work. Employed Labor Force is measured by place of residence (i.e., where a worker resides). Wage and salary employment measures the number of jobs by place of work, a measure of the actual number of jobs within a given area. It must be noted that the number of jobs by place of work presented below is different than the number of jobs by place of residence presented in the preceding paragraph (i.e., there were approximately 1.29 jobs in Imperial County in 1991 for every employed worker that lived in Imperial County). The following examples will help the reader understand the differences between these two measures (place of work and place of residence) of employment:

1. A worker who lives in Imperial County and works in a different county, say Riverside County. This worker's job would be included as one job by place of residence in Imperial County but would not be counted as a job by place of work in Imperial County (i.e., the worker's job would be counted as a job by place of work in Riverside County).

2. A worker who lives in Imperial County and has two jobs in Imperial County. This worker's job would be counted as one job by place of residence in Imperial County and two jobs by place of work in Imperial County.

3. A worker who lives in Riverside County and works in Imperial County. This worker's job would not be counted as a job by place of residence in Imperial County but would be counted as a job by place of work in Imperial County.

4. A worker who lives in Imperial County and has ten jobs in one year (e.g., a farmworker who travels from one farm to another within Imperial County to harvest crops). This worker's job would be counted as one job by place of residence and ten jobs by place of work in Imperial County.

In recent years, Imperial County's employment patterns have shifted away from agriculture. In 1989, approximately 25 percent of county jobs were in the agricultural sector, and Imperial County's agricultural sector is the largest employer in the County. Approximately 3,950 agricultural jobs were lost in Imperial Valley between 1989 and 1991, and the agricultural employment dropped from 25 percent to 16.9 percent in the County, and from the largest to the fourth largest employment sector in the County by 1991. The government sector was the largest employer (23 percent) followed by the services sector (18.9 percent) and the retail trade sector (18.4 percent) in 1991. The largest economic sector in 1991, by number of jobs, in the State of California was the services sector at 30.2 percent followed by the retail trade sector at 16.0 percent. Government was the third largest sector of the state economy in 1991, by number of jobs, at 15.3percent. Agriculture was ranked seventh largest by number of jobs of the eight primary economic sectors in the State at approximately 1.9 percent. There was an estimated 49,867 jobs and 38,450 employed workers in Imperial County in 1991, for an average of 1.29 jobs per worker. This compares to an average number of jobs per worker of 1.18 for the State of California in 1991.

By 1997, government employment in Imperial County is expected to be approximately 12,500, an increase of over 2,000 jobs, primarily associated with increased employment at the Calipatria State Prison and by the U.S. Customs at the border and the opening of a new State prison at Seeley. The government sector is expected to be the leading employer in Imperial County for the foreseeable future. During this same period, agricultural jobs are expected to continue to decline in Imperial County (EDD, 1992).

Wage and salary earnings in Imperial County totaled approximately $933.1 million in 1991, approximately 0.2 percent of the total wage and salary earnings in the state (Table 19). The largest sector, by earnings, in Imperial County in 1991 was government, with 32.8 percent of the total followed by services with 18.2 percent of the total. For the state, the largest sectors in 1991, by earnings, were services (28.9 percent) and manufacturing (17.6 percent). Agriculture was the fourth largest sector by earnings in the County in 1991. Agriculture was the seventh largest sector by earnings in the state economy in 1991.

This was reflected in the average earnings per job in Imperial County in 1991 (Table 20). Agricultural jobs in the County averaged $11,537 per year (the reader is reminded that this is employment by place of work and that the average agricultural worker holds more than one job per year resulting in a higher average earnings per year by place of residence) as compared to $27,047 for transportation and public utility jobs and $39,337 for jobs in the mining sector (Table 20). The low agricultural earnings also bring down average earnings in Imperial County on a per job basis ($20,741) as compared to non-agricultural average earnings ($22,618 per job).

Earnings per job in Imperial County are lower than earnings per job in the State of California. For example, the average agricultural job in the state of California paid $13,527, 17 percent higher than the average wage for an agricultural job in Imperial County. The average transportation and public utility job in the state paid $39,681, 47 percent higher than the average wage for a transportation job in Imperial County. On average, a wage and salary job in Imperial County pays 72 percent of the state average for all wage and salary jobs and 77 percent of the average wage for non-agricultural wage and salary jobs.

4.1.2 Existing Employment and Income at the Proposed Site

Currently, Gold Fields Mining Company operates Mesquite Gold Mine at and adjacent to the proposed landfill site. The direct and indirect employment and earnings associated with the gold mine are summarized below.

The gold mine employed 370 workers in fiscal year ending September 1992 and paid salaries of approximately $11.5 million dollars plus benefits of $5.5 million (Arid Operations, 1992). The average wage paid to employees for fiscal year 1992 was approximately $31,000 with an additional $14,850 in benefits paid per worker.

It is currently anticipated that the Mesquite Gold Mine will close down operations within the next ten to fifteen years. Therefore, the employment, income, and government revenues currently generated by the gold mine will be lost in the future.

TABLE 19

1991 Wage and Salary Earnings for Imperial County and the State of California Proposed Mesquite Regional Landfill

	Imperial County[a] (in thousands)		State of California[a] (in thousands)	
Agricultural Services, Forestry & Fishing	$ 87,921	9.4%	$ 4,132,974	0.9
Mining	29,267	3.1	1,992,982	0.4
Construction	52,375	5.6	26,263,940	5.7
Manufacturing	39,875	4.3	81,292,067	17.6
Transportation & Public Utilities	43,167	4.6	27,172,554	5.9
Wholesale Trade	57,471	6.2	29,036,546	6.3
Retail Trade	122,482	13.1	45,727,337	9.9
F.I.R.E.*	24,561	2.6	33,343,560	7.2
Services	169,959	18.2	137,341,652	29.7
Government	305,982	32.8	75,845,817	16.4
Total Non Agricultural	$ 845,139		$ 458,016,455	
TOTAL	$ 933,060		$ 462,149,492	

Notes: Numbers may not add due to rounding.
(*) F.I.R.E. = Finance, Insurance and Real Estate.
(**) Denotes figures withheld to avoid disclosing data for individual companies.
N/A = Not Available

Source: (a) U.S. BEA, 1993.

TABLE 20

1991 Average Earnings Per Job (Average Annual Wage)
Imperial County and the State of California
Proposed Mesquite Regional Landfill

	Imperial County[1]	State of California[1]
Agricultural Services, Forestry & Fishing	$ 11,537	$ 13,527
Mining	39,337	39,939
Construction	24,964	34,904
Manufacturing	23,346	38,715
Transportation & Public Utilities	27,047	39,681
Wholesale Trade	24,508	36,984
Retail Trade	14,508	17,889
F.I.R.E.*	14,764	22,758
Services	13,845	28,532
Government	20,123	31,045
Average Earnings for Non-Agricultural Wage and Salary Jobs	$ 22,618	$ 29,266
Average Earning for Wage and Salary Jobs (1989$)	$ 20,741	$ 28,965

Notes: Numbers may not add due to rounding.

(1) Derived by dividing annual average workers provided on Table 18 by annual payroll shown on Table 19

(2) Earnings for employment by place of work. The reader is reminded that many agricultural workers tend to hold many jobs per year. (i.e., they travel from farm to farm as needed).

(3) Derived by dividing total annual non-agricultural workers provided on Table 18 by total annual non-agricultural payroll shown on Table 19

(*) F.I.R.E. = Finance, Insurance and Real Estate.

(**) Denotes figures withheld by the US Department of Commerce to avoid disclosing data for individual companies.

Source: The Butler Roach Group, Inc., 1993.

Other local employers include the Glamis Beach Store, various aggregate producers who periodically mine aggregate in the area, and BLM which manages the adjacent federal lands. Because it is not expected that these jobs would be impacted by the proposed project and because many of these jobs are seasonal, no effort has been made to quantify employment and earnings associated with these activities.

4.2 Demographics

The following section includes a discussion of various demographic issues applicable to the proposed project. To obtain a better understanding of the demographic conditions in Imperial County, a comparison of similar demographic characteristics for the State of California, and the United States is included.

4.2.1 Selected Demographic Statistics

Selected demographic statistics for 1990 for the County of Imperial, State of California, and the United States are shown on Table 21. The total population of Imperial County was estimated to be 109,303 in 1990. This represented 0.4 percent of the population of the State of California (29,760,021) and 0.04 percent of the population of the United States (248,710,000). The 1989 per capita personal income for Imperial County was estimated to be $12,712. This was 64 percent of the per capita personal income for the State of California ($19,840) and 72 percent of the per capita personal income of the United States. The number of persons per household in the County of Imperial was estimated to be 3.26 in 1990. This is 17 percent larger than the average household size in the State of California (2.79) and 24 percent larger than the average household size in the United States (2.63)

4.2.2 Ethnicity

The 1990 ethnicity information for the County of Imperial, the State of California, and the United States, as reported by the US Bureau of the Census, is shown on Table 22. The Census reports that in 1990, the approximate ethnic makeup for Imperial County was approximately 29 percent white, 2 percent black, 66 percent hispanic, and 3 percent persons of other ethnic backgrounds. The approximate 1990 ethnic makeup for the State of California was 57 percent white, 7 percent black, 26 percent hispanic and 10 percent persons of other ethnic backgrounds. The approximate 1990 ethnic makeup for the United States was 76 percent white, 12 percent black, 9 percent hispanic, and 3 percent persons of other ethnic backgrounds. Also, 25 percent of the County's population are school-aged (i.e., 5-17) versus 18 percent for the State and nation.

4.2.3 Age Distribution

Age distribution information for 1990 is provided on Table 22, in 1990 the majority of persons in Imperial County, the State of California, and the United States were within the age bracket of 25 to 34 years of age (U.S. Bureau of the Census, 1990). The major difference between Imperial County's and the state's and nation's age distribution is that Imperial County's

TABLE 21

1990 Selected Demographic Statistics
Imperial County, State of California, United States
Proposed Mesquite Regional Landfill

	Imperial County	State of California	United States
Total Population	109,303[a]	29,760,021[a]	261,259,000[b]
Per Capita Personal Income (1989)	$12,712[a]	$19,840[a]	$17,621[b]
Household Size	3.26[c]	2.79[c]	2.63[b]

	Imperial County[a]		State of California[a]		United States[b]	
	Total	% of Total	Total (in thousands)	% of Total	Total (in thousands)	% of Total
Ethnicity as Reported by the US Bureau of the Census (1990)						
White	31,742	29.0%	17,029,126	57.2%	199,686,000	76.4%
Black	2,272	2.1%	2,092,446	7.0%	29,986,000	11.5%
Hispanic	71,935	65.8%	7,687,938	25.8%	22,354,000	8.6%
Asian & Pacific Islander	1,632	1.5%	2,710,353	9.1%	7,274,000	2.8%
American Indian, Eskimo, Aleut	1,722	1.6%	240,158	0.8%	1,959,000	0.7%
Total	**109,303**	**100.0%**	**29,760,021**	**100.0%**	**261,259,000**	**100.0%**

Source: (a) 1991 California Statistical Abstract.
(b) 1991 U.S. Statistical Abstract.
(c) 1990 Census of Population and Housing.

TABLE 22

1990 Population Age Distribution
Imperial County, State of California, United States
Proposed Mesquite Regional Landfill

	Imperial County[a]		State of California[a] (in thousands)		United States[b] (in thousands)	
	Total	% of Total	Total	% of Total	Total	% of Total
Under 5 years	9,986	9%	2,489	9%	18,752	8%
5 to 17 years	27,473	25%	5,225	18%	45,330	18%
18 to 24 years	11,095	10%	3,018	10%	26,346	11%
25 to 44 years	31,334	29%	10,003	34%	80,338	32%
45 to 54 years	9,421	9%	2,891	10%	24,897	10%
55 to 64 years	8,886	8%	2,366	8%	21,593	9%
65 years and over	11,108	10%	3,071	11%	30,985	12%
TOTAL	109,303	100%	29,063	100%	248,239	100%
16 years and over	75,980	70%	22,081	76%	191,047	77%

Source: (a) 1990 Census of Population and Housing.
(b) 1991 U.S. Statistical Abstract.

population is somewhat younger (e.g. 24 percent of Imperial County's population is 24 years of age or younger compared to 37 percent for the state and nation).

4.2.4 Income

The 1990 median household incomes for Imperial County and various cities within the County are shown on Table 23. Overall, Imperial County had a 1990 median household income of $22,422.

4.2.5 Population Projections

Table 24 provides the total existing and projected population data for Imperial County and the State of California for 1990, 2000, 2010, and 2040. Between 1990 and 2040 the average annual compound population growth rate for Imperial County is projected to be 2.1 percent and the average annual compound population growth rate for California is projected to be 1.5 percent.

4.3 Imperial County Revenues and Expenditures

The County of Imperial derives revenue from seven broad sources. For fiscal year (FY) 1992-1993, the revenue derived by sources is presented in Table 25. These revenues are expended by the County to provide services to its citizens. County expenditures for FY 1992-1993 are summarized on Table 25.

4.4 Property Values

4.4.1 Introduction

Property values near a proposed project can be negatively affected, positively affected, or not affected at all. The affect of a project on property values is determined by the degree to which a project changes the use of a particular property. For example, a new roadway built to an otherwise land-locked property would generally increase property values. Projects which negatively impact a neighboring property generally decrease property values.

Property values are established based on an individual's perceived utility of a given parcel and are typically defined by the selling price, which is used by the Imperial County and other California counties to determine the appraised value of a property for computing taxes. Many factors can affect the utility of a parcel, including existing structures, proximity to major transportation routes and destinations, neighboring uses, and potential future uses (zoning and community plan designations).

When a property is purchased, the various factors that are known to the purchaser are considered during negotiation of the purchase price. Of course, if the purchaser is not aware of certain factors that may affect a properties utility, the purchaser cannot make a reasoned determination of the value of the property. For this reason, the State of California currently requires that the seller of a given property fully disclose all pertinent factors that may negatively impact the value of the property being offered for sale.

TABLE 23

1990 Median Household Income, Imperial County
Proposed Mesquite Regional Landfill

City/County	Household Income
Brawley	$22,365
Calexico	$18,635
Calipatria	$20,254
El Centro	$25,147
Heber CDP	$20,306
Holtville	$21,083
Imperial	$32,000
Niland CDP	$16,207
Seeley CDP	$21,689
Westmorland	$21,359
Imperial County	$22,422

Note: CDP = Census Designated Place, an area that is defined by the U.S. Bureau of the Census to facilitate data collection, reporting and analysis.

Source: Southern California Association of Governments, Census Data, 1990.

TABLE 24

Projected Population for
Imperial County and State of California, 1990, 2010, and 2040
Proposed Mesquite Regional Landfill[1]

	1990	2000	2010	2040
Imperial County	110,400	1542,300	183,000	310,000
California	29,976,000	36,444,000	42,408,000	63,343,000

	1990-2040 Numeric Growth	Annual Avg. Compound Growth Rate
Imperial County	199,600	2.09%
California	33,367,000	1.51%

Notes: (1) Population projections given for the month of July for each projection year.

Source: Ca Dept. of Finance, April 1993.

TABLE 25

County of Imperial Revenues and Expenditures
FY 1992-1993
Proposed Mesquite Regional Landfill

Revenues

Revenue Source	Amount
Aid from Other Governmental Agencies	$ 81,233,527
Total Taxes	21,363,294
Other Revenues	4,661,760
Charges for Current Services	18,497,104
Use of Money and Property	1,910,088
Fines, Forfeitures, and Penalties	2,108,901
Licenses and Permits	3,578,441
Grand Total	$ 133,353,115

Expenditures

County Function	Amount
Public Assistance	$ 56,520,067
Public Protection	34,556,713
General Government	19,739,930
Public Ways and Facilities	9,807,093
Health and Sanitation	13,472,499
Appropriation for Contingencies	918,888
Education	740,506
Grand Total	$ 135,755,696

Source: Imperial County, 1993.

Public comments at the Indio Public Scoping Meeting (May 28, 1992) did express a concern for property value impacts along the proposed haul route. Therefore, the discussion of property values in the EIS/EIR will be limited to impacts to property values along the rail haul route.

4.4.2 Properties Near the Proposed Rail Haul Route

As described in Chapter 2, the proposed rail haul would occur along the existing Southern Pacific Main Line. This line has been owned by Southern Pacific since 1877. It is anticipated that MSW would be hauled by rail from an intermodal facility in the LATC and end at the proposed landfill site. The total distance is approximately 216 miles.

A large number of private and public properties lies adjacent to or within sight/hearing distance of the existing main line. These properties have been subject to train-related impacts on a daily basis for over one hundred years. While the level of rail activity has fluctuated over the years, the main line has been in constant use since 1877.

All properties along the main line currently experience the normal operational effects of train traffic on a daily basis, including evenings, nights, and early mornings. In addition, these properties are subjected to a certain level of risk associated with the material carried train traffic along the main line.

Materials carried along the main line include a wide variety of goods ranging from raw materials to finished consumer products. Typically, these materials are relatively inert and, similar to municipal solid waste, are not identified as being hazardous. However, hazardous substances including acutely hazardous materials, flammable materials, materials known to the State of California to be toxic and/or carcinogenic, and explosives are also carried on the main line. Because hazardous materials are transported along the main line, Southern Pacific has an approved emergency plan. This plan fully describes the measures to be implemented in the event of a spill of any hazardous material along the main line (Section 4.12, Transportation).

5.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

5.1 Significant Environmental Impacts

5.1.1 Proposed Landfill Site

Employment and Income

As described in Chapter 2 and shown in Table 26 , it is expected that up to 268 persons would be directly employed at the proposed landfill during peak operations. Prior to project start up, approximately 150 construction workers would be hired for a period of approximately 10 months to construct the various facilities including the rail spur, intermodal, access roads, base liner and leachate collection system, drainage facilities, buildings, utilities, fencing, and monitoring system. Table 26 presents project-related direct and indirect employment by year.

TABLE 26

Project-Related Direct Workers by Place of Residence and Indirect/Induced Workers by Place of Residence from Project-Related Purchases of Goods and Services in Imperial County

Proposed Mesquite Regional Landfill

Employment Category	Initial Construction (Peak Employment)	Long-Term Operations
Imperial County Residents		
Direct Workers	75	134
Indirect/Induced Workers	633	60
Subtotal Imperial County	708	194
Residents of Other Counties		
Direct Workers	75	134
Indirect/Induced Workers	59	5
Subtotal Other Counties	134	139
Total Workers		
Direct Workers	150	268
Indirect/Induced Workers	692	65
Total	842	333

Source: Environmental Solutions, Inc., 1992; The Butler Roach Group, 1993.

Approximately 12,975 workers were unemployed in Imperial County in June 1993 (EDD, 1993). Many of these workers are agricultural workers. However, based on the past experience at the gold mine, it is expected that the unemployed labor pool in Imperial County is more than adequate to fill the majority of project-related jobs.

Assuming that at least 50 percent of the projected direct workers and 91.5 percent of the indirect workers (whose jobs were created by project-related purchases of goods and services in Imperial County) are local hires and assuming the County average of 1.29 jobs per worker for indirect workers and one job per worker for direct workers, almost 700 County residents would be employed directly or indirectly by the proposed project during the peak construction year. Approximately 200 local residents would be employed directly or indirectly during long-term operations (years 8 to 100).

The expected increase in local hiring would reduce Imperial County's unemployment rate. Using 1993 civilian labor force and unemployment data, long-term hiring would reduce the unemployment rate by an estimated 0.4 percentage points from 24.2 percent to 23.8 percent. During the first year of construction, the unemployment rate would temporarily decrease by approximately 1.3 percentage points from 24.2 percent to 22.9 percent.

Project-related direct earnings of Imperial County residents would amount to approximately $4.0 million for long term operations and $1.9 million for initial construction (Table 27). Indirect earnings of Imperial County Residents would amount to $1.38 million for long term operations and 6 $14.57 million for initial construction. The total projected long-term increase in earnings associated with the proposed landfill would be approximately $9.5 million 5.38 million of which would accrue to Imperial County Residents. Because project-related direct wages of $30,000 for operations workers per year would exceed the average wages per job paid in Imperial County, the average earnings for wage and salary jobs would be increased. This would be a beneficial effect of the proposed project. (Average wages paid to indirect workers is expected to be about 30 percent less than the average wage paid to direct workers.)

Over the initial 20 years of the project, over a quarter of a billion dollars would flow through the economy in the form of direct employee payroll and benefit payments from the Mesquite Regional Landfill, if the landfill operates as described in Chapter 2.0 of the EIS/EIR. Well over a half a billion dollars would be expended on the Mesquite Regional Landfill over the first twenty years of its proposed life. Major expenditure items would include purchases of goods and services, construction costs, equipment, financing, and of course, payroll and benefits. A substantial portion of these expenditures would remain in the local economy. The rest would flow to major equipment sales and manufacturing centers.

Demographics

As described previously, long-term, project-related inmigration to Imperial County would be caused by the hiring of workers from outside of Imperial County. Short-term effects would occur during construction. Demographic effects would be small and therefore, not noticeable.

TABLE 27

Estimated Project-Related Earnings from Direct Payrolls and Indirect/Induced Jobs Created by Purchases of Goods and Services in Imperial County

Proposed Mesquite Regional Landfill

Employment Category	Construction	20,000 Tons/Day
Earnings (Millions 1992$)		
Imperial County Residents		
Direct	$1.90	$4.00
Indirect	14.57	1.38
Subtotal Imperial County	$16.47	$5.38
Residents of Other Counties		
Direct	$1.90	$4.00
Indirect	1.36	0.12
Subtotal Other Counties	$3.26	$4.12
Total Earnings		
Direct	$3.80	$8.00
Indirect	15.93	1.50
Total	$19.73	$9.50

Source: The Butler Roach Group, Inc., 1993.

It is anticipated that the proposed project would result in a very small net inmigration to Imperial County. Therefore, the project would not have a significant affect on population.

Imperial County Revenues and Expenditures

Revenues. Imperial County will receive both direct and indirect revenue from the proposed Mesquite Regional Landfill. It is not possible to accurately predict the extent of all revenues and expenditures. The following analysis describes the likely sources of revenues and expenditures.

The County will generate revenues through it's normal revenue sources described previously in Chapter 4. Specifically, the County will receive revenue from the following:

- Total Taxes - This includes property, income, utility, and sales tax revenues.
- Charges for Current Service - This includes all charges related to landfill permitting and inspections that would be paid by Arid Operations, Inc. Also included are charges for service that would be paid by landfill-related workers (e.g., building permits to add a new room to their private residence).
- Licenses and Permits - This would include the cost of business licenses and operating permits.
- Host Fees (sometimes called import fees).

In addition to normal County revenue sources, a host fee would be paid to the County on a per ton basis. For example, if a dollar in host fee were paid for each ton of MSW deposited at the landfill, and if the landfill were to operate at tonnage rates discussed in Chapter 2 of the EIS/EIR, Imperial County could receive in excess of $100 million during the first 20 years of operation. An additional $100 million would be paid for each $1.00 increase in the per ton host fee.

Obviously, if the rate differs from that shown in the EIS/EIR-for example, if the tonnage were reduce-the total dollars paid through the host fee would be changed accordingly.

Expenditures. Project related County costs would include expenditures for activities by the following County Functions:

- Permitting and Monitoring
- Public Services

The County recovers the cost of the various process-related costs, such as inspections and permitting, through fees described in Chapter 4 of the EIS/EIR. As described in Chapter 5 of this EIS/EIR, Public Services, it is not expected that County services would be significantly impacted by the proposed project. Therefore, it is expected that County costs would be covered by the aforementioned County revenue sources.

The question of financial liability was raised at the El Centro and Indio Public Scoping Meetings. Specifically, the question was asked who would be responsible for landfill maintenance after closure and who would be responsible for clean up in the event of a landfill-related leak. As required by law 40 CFR Subpart 6, Financial Assurance Criteria (effective April 4, 1994) the Applicant would prepare a initial estimate of the closure and post closure maintenance costs for the proposed Mesquite Regional Landfill. This estimate would be submitted to the Integrated Waste Management Board for approval. Arid Operations, Inc. would then establish a trust fund or equivalent financial arrangement acceptable under the prevailing Financial Assurance requirement prior to the issuance of a Solid Waste Facilities Permit.

5.1.2 Property Values Along the Haul Route

As discussed in Chapter 3 of the EIS/EIR, the existing Southern Pacific Railroad Main Line has been in service since 1877. It is expected that the majority of residential and otherwise sensitive land uses along the main line have come under new ownership since the main line was completed. Because the presence of a railroad is known to potential land buyers, it is assumed that land owners who purchased their property since the main line was completed have already discounted the utility of their property for the effects, both existing and potential, of the rail traffic on the main line.

The trains required to haul MSW to the proposed landfill would be very similar to existing trains that use the main line. The MSW is by definition, non-hazardous, and therefore, less dangerous than much of the existing cargo that travels the main line. Therefore, the proposed project would not impact property values along the existing Southern Pacific Rail Road Main Line.

5.2 Mitigation Measures

5.2.1 Proposed Landfill Site

Construction and operation of the proposed Mesquite Regional Landfill would create beneficial socioeconomic impacts in Imperial County. The project would create additional jobs, and raise the total and average level of wage and salary earnings within the County. County population would not be reduced and may grow somewhat. The immigrants would, on average, be expected to have somewhat different age characteristics and ethnic backgrounds than the existing residents. These differences would not change the ethnic makeup or age distribution of County residents by more than one percent. The Applicant shall provide the regulatory mandated financial assurances for closure, post closure, and corrective action. Finally, it is expected that the proposed project would be a net revenue producer for the County of Imperial and that the County's expenditure to revenue ratio would be decreased as compared to a "no action" alternative. For all of these reasons socioeconomic impacts would be below a level of significance. Therefore, mitigation would not be required.

Mitigation Measures Incorporated by Regulation

40 CFR Subpart G, Financial Assurance Criteria (effective date April 9, 1994) will require the owners and operators of all MSW landfills, except owners or operators who are State or Federal government entities whose debts and liabilities are the debts and liabilities of a State or the United States, to provide financial assurance for landfill closure, post closure care, and corrective action.

Owner/operators subject to the requirements of Subpart G will be required to provide written cost estimates for landfill closure, post closure care, and corrective action as described in §258.71, 258.72, and 258.73, respectively. The law provides that these estimates and the required financial assurance must be updated if conditions change resulting in an increase or decrease in the estimated cost of closure, post closure care, or corrective action.

40 CFR Subpart G, §258.74 provides for 11 methods of providing the financial assurance that will be required beginning on April 9, 1994 under existing law. The Applicant proposes to provide the required assurance through one of these mechanisms or as required in the future.

5.2.2 Property Values Along the Haul Route

The mitigation measures identified in the Noise, Transportation, and Health and Safety Sections of this EIS/EIR, as required to mitigate rail haul impacts, shall be implemented to ensure that property values along the Southern Pacific Main Line are below a level of significance.

5.3 Level of Significance After Mitigation

5.3.1 Proposed Landfill Site

Implementation of the Proposed Action would result in beneficial socioeconomic impacts.

5.3.2 Property Values Along the Haul Route

Property values would not be significantly affected by the Proposed Action.

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